Idea of Speed, Distance and Time

EXERCISE 17(A)

Question 1.
A train covers 51 km in 3 hours. Calculate its speed. How far does the train go in 30 minutes?
Solution:
Given : Distance = 51 km
Time = 3 hours

$$\therefore \text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$= \frac{51}{3} = 17 \text{ km/h}$$

Now,

$$\text{Time} = 30 \text{ minutes} = \frac{30}{60}\text{h} = \frac{1}{2}\text{h}$$

Speed = 17 km/h

$$\therefore \text{Distance travelled} = \text{Speed} \times \text{Time}$$

$$= 17 \times \frac{1}{2} = 8.5 \text{ km}$$

Question 2.
A motorist travelled the distance between two towns, which is 65 km, in 2 hours and 10 minutes. Find his speed in metre per minute.
Solution:
Distance between two towns = 65 km
Time taken = 2 hr 10 min

$$= 2\frac{10}{60} = 2\frac{1}{6} = \frac{13}{6} \text{ hrs}$$

$$\therefore \text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{65}{\frac{13}{6}}$$

$$= \frac{65 \times 6}{13} \text{ km/h} = 30 \text{ km/h}$$

$$\text{and speed in m/minute} = \frac{30 \times 1000}{60}$$

$$= 500 \text{ m/minute}$$

Question 3.
A train travels 700 metres in 35 seconds. What is its speed in km/h?

Solution:
Distance = 700 m
Time taken = 35 sec

$$\therefore \text{ Speed in m/sec} = \frac{\text{Distance}}{\text{Time}}$$

$$= \frac{700}{35} = 20 \text{ m/sec}$$

$$\text{and Speed in km/h} = \frac{20 \times 60 \times 60}{1000}$$

$$= 72 \text{ km/h}$$

Question 4.
A racing car covered 600 km in 3 hours 20 minutes. Find its speed in metre per second. How much distance will the car cover in 50 sec?
Solution:
Distance covered = 600 km
Time taken = 3 hr 20 min

$$= 3\frac{20}{60} = 3\frac{1}{3} = \frac{10}{3} \text{ hrs}$$

$$\therefore \text{ Speed in km/h} = \frac{\text{Distance}}{\text{Time}} = \frac{600}{\frac{10}{3}}$$

$$= \frac{600 \times 3}{10} \text{ km/h} = 180 \text{ km/h}$$

$$\text{and Speed in m/sec} = \frac{180 \times 1000}{60 \times 60}$$

$$= 50 \text{ m/sec}$$

and Distance covered in 50 seconds
= Speed x Time
= 50 x 50 m = 2500 m or 2.50 km

Question 5.
Rohit goes 350 km in 5 hours. Find :
(i) his speed
(ii) the distance covered by Rohit in 6.2 hours
(iii) the time taken by him to cover 210 km.
Solution:
Distance covered = 350 km

Time taken = 5 hours

(*i*) $\therefore$ Speed $= \frac{\text{Distance}}{\text{Time}} = \frac{350}{5}$

$= 70$ km/hr

(*ii*) Distance covered in 6·2 hours

$= 70 \times 6{\cdot}2$ km $= 434$ km

(*iii*) Time taken to cover 210 km

$= \frac{\text{Distance}}{\text{Time}} = \frac{210}{70}$ hr $= 3$ hours

Question 6.

A boy drives his scooter with a uniform speed of 45 km/h. Find :
(i) the distance covered by him in 1 hour 20 min.
(ii) the time taken by him to cover 108 km.
(iii) the time taken to cover 900 m.

Solution:

Speed of the scooter = 45 km/h

Time taken $= 1\frac{20}{60} = 1\frac{1}{3} = \frac{4}{3}$ hours

(*i*) Distance covered in 1 hour 20 minutes

$= 45 \times \frac{4}{3}$ km $= 60$ km

(*ii*) Time taken to cover 108 km $= \frac{\text{Distance}}{\text{Time}}$

$= \frac{108}{45}$ hrs

$= \frac{12}{5} = 2\frac{2}{5}$ hours

$= 2$ hours 24 minutes

(*iii*) Time taken to cover 900 m

= Distance × Speed

$= \frac{900}{1000} \times \frac{1}{45} = \frac{1}{50}$ hr

$= \frac{60}{50} = \frac{6}{5} = 1\frac{1}{5}$ minutes

= 1 : 2 minute or 1 minutes 12 seconds

Question 7.

I travel a distance of 10 km and come back in $2\frac{1}{2}$ hours. What is my speed?

Solution:

Total distance covered = 10 km + 10 km = 20 km

$$\text{Time taken} = 2\frac{1}{2} = \frac{5}{2} \text{ hours}$$

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{20}{\frac{5}{2}}$$

$$= \frac{20 \times 2}{5} \text{ km/h} = 8 \text{ km/hr}$$

Question 8.

A man walks a distance of 5 km in 2 hours. Then he goes in a bus to a nearby town, which is 40 km, in further 2 hours. From there, he goes to his office in an autorickshaw, a distance of 5 km, in $\frac{1}{2}$ hour. What was his average speed during the whole journey?

Solution:

Distance of 5 km travelled on foot in 2 hours

Distance of 40 km travelled by bus in 2 hours

Distance of 5 km travelled by Rickshaw in $\frac{1}{2}$ hour

Total distance covered = 5 + 40 + 5 = 50 km

$$\text{Time taken} = 2 + 2 + \frac{1}{2} = 4\frac{1}{2} = \frac{9}{2} \text{ hours}$$

$$\therefore \text{ Average speed} = \frac{\text{Distance}}{\text{Time}} = \frac{50}{\frac{9}{2}}$$

$$= \frac{50 \times 2}{9} = \frac{100}{9} \text{ km/h}$$

$$= 11\frac{1}{9} \text{ km/h}$$

Question 9.

Jagan went to another town such that he covered 240 km by a car going at 60 kmh^{-1}. Then he covered 80 km by a train, going at 100 kmh^{-1} and the rest 200 km, he covered by a bus, going at 50 kmh^{-1}. What was his average speed during the whole journey?

Solution:

Distance covered 240 km by car with speed 60 km/h

Distance covered 80 km by train with speed 100 km/h

and rest distance covered 200 km by bus with speed 50 km/h

Total distance covered = (240 + 80 + 200) km = 520 km

$$\text{Now time taken by car} = \frac{240}{60} = 4 \text{ hours}$$

$$\text{Time taken by train} = \frac{80}{100} = \frac{4}{5} \text{ hours}$$

$$\text{and time taken by bus} = \frac{200}{50} = 4 \text{ hours}$$

$\therefore$ Total time taken

$$= 4 + \frac{4}{5} + 4 = 8\frac{4}{5} = \frac{44}{5} \text{ hours}$$

$\therefore$ Average speed

$$= \frac{\text{Distance}}{\text{Time}} = \frac{520}{\frac{44}{5}} = \frac{520 \times 5}{44} \text{ km/h}$$

$$= \frac{650}{11} = 59\frac{1}{11} \text{ km/h}$$

Question 10.

The speed of sound in air is about 330 ms^{-1}. Express this speed in kmh^{-1}. How long will the sound take to travel 99 km?

Solution:

Speed of sound in air = 330 m/sec

$\therefore$ Speed in km/h $= \frac{330 \times 60 \times 60}{1000}$

$= 1118$ km/h .

Time taken by sound to cover 99 km

$$= \frac{99}{1188} = \frac{1}{12} \text{ hours}$$

$$= \frac{1}{12} \times 60 = 5 \text{ minutes}$$

or $5 \times 60 = 300$ seconds

EXERCISE 17(B)

Question 1.

A train 180 m long is running at a speed of 90 km/h. How long will it take to pass a railway signal?

Solution:
Distance = 180 m
Speed = 90 km/h

$$\therefore \text{ Time taken } = \frac{180}{90 \times 1000} \triangleq \frac{1}{500} \text{ hrs}$$

$$= \frac{1 \times 60 \times 60}{500} = \frac{36}{5} = 7{\cdot}2 \text{ seconds}$$

Question 2.
A train whose length is 150 m, passes a telegraph pole in 10 sec. Find the speed of the train in km/h.
Solution:
Distance = 150 m
Time taken = 10 sec

$$\therefore \text{ Speed } = \frac{150}{10} = 15 \text{ m/s}$$

$$= \frac{15 \times 60 \times 60}{1000} \text{ km/h} = 54 \text{ km/h}$$

Question 3.
A train 120 m long passes a railway platform 160 m long in 14 sec. How long will it take to pass another platform which is 100 m long?
Solution:
Distance covered = 120 m + 160 m = 280 m
Time taken = 14 seconds

$$\therefore \text{ Speed } = \frac{\text{Distance}}{\text{Time}}$$

$$= \frac{280}{14} = 20 \text{ m/s}$$

In seconds case, distance
= 120 + 100 = 220 m

$$\therefore \text{ Time taken } = \frac{220}{20} \text{ sec} = 11 \text{ sec}$$

Question 4.
Mr. Amit can walk 8 km in 1 hour 20 minutes.
(a) How far does he go in :
(i) 10 minutes ?
(ii) 30 seconds ?

(b) How long will it take him to walk :
(i) 2500 m ?
(ii) 6.5 km ?

Solution:

Amit walks 8 km in 1 hour 20 min

$$\text{or } 1\frac{1}{3} = \frac{4}{3} \text{ hours}$$

$$\therefore \text{ Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$= \frac{8}{\frac{4}{3}} = \frac{8 \times 3}{4} = 6 \text{ km/h}$$

(a) (*i*) Distance covered in 10 minutes

$$= \frac{6 \times 1000 \times 10}{60} = 1000 \text{ m} = 1 \text{ km}$$

(*ii*) Distance covered in 30 seconds

$$= \frac{6 \times 1000 \times 30}{60 \times 60} = 50 \text{ m}$$

(b) (*i*) Time taken in 2500 m $= \frac{2500}{1000 \times 6}$

$$= \frac{5}{12} \text{ hours} = \frac{5}{12} \times 60 = 25 \text{ minutes}$$

(*ii*) Time taken in 6·5 km

$$= \frac{6{\cdot}5}{6} = \frac{65}{60} \text{ hours}$$

$$= 1 \text{ hour } 5 \text{ minutes}$$

Question 5.

Which is greater : a speed of 45 km/h or a speed of 12.25 m/sec?
How much is the distance travelled by each in 2 seconds?

Solution:

First speed = 45 km/h

Second = 12.25 m/sec

$$= \frac{12{\cdot}25 \times 60 \times 60}{1000} \text{ km/h}$$

$$= \frac{1225 \times 60 \times 60}{100 \times 1000}$$

$$= \frac{441}{10} = 44{\cdot}1 \text{ km/h}$$

It is clear from above that 45 km/h is greater.

Distance covered in 2 seconds by 45 km/h

$$\text{Speed} = \frac{45 \times 1000 \times 2}{60 \times 60} = 25 \text{ m}$$

and distance covered in 2 seconds by 12·25 m/sec = 12·25 × 2 = 24·50

Question 6.

A and B start from the same point and at the same time with speeds 15 km/h and 12 km/h respectively, find the distance between A and B after 6 hours if both move in :
(i) same direction
(ii) the opposite directions.

Solution:

A's speed = 15 km/h
B's speed = 12 km/h
Distance covered by A in 6 hours = 15 x 6 = 90 km
and Distance covered by B in 6 hours = 12 x 6 = 72 km
(i) Distance between A and B when they move in the same direction = 90 – 72 = 18 km
(ii) Distance between A and B, when they move in the opposite directions = 90 + 72 = 162 km

Question 7.

A and B start from the same place, in the same direction and at the same time with speeds 6 km/h and 2 m/sec respectively. After 5 hours who will be ahead and by how much?

Solution:

A's speed = 6 km/h
B's speed = 2 m/sec
Distance covered by A in 5 hours = 6 x 5 = 30 km
and distance covered by B in 5 hours = 5 x 60 x 60 x 2 m = 36000 m
$= \frac{3600}{1000}$ = 36 km
B will be ahead and 36 – 30 = 6 km ahead.

Question 8.
Mohit covers a certain distance in 6 hrs by his scooter at a speed of 40 kmh^{-1}.
(i) Find the time taken by Manjoor to cover the same distance by his car at the speed of 60 kmh^{-1}.
(ii) Find the speed of Joseph, if he takes 8 hrs to complete the same distance.
Solution:
Mohit's speed = 40 km/h or kmh^{-1}
Distance covered in = 6 hours
Distance = 40 x 6 = 240 km
(i) Manjoor car's speed = 60 kmh^{-1}
He will cover the distance of 240 km in = $\frac{240}{60}$ = 4 hours
(ii) Joseph covered that distance in 8 hours
His speed = $\frac{240}{8}$ = 30 kmh^{-1}

Question 9.
A boy swims 200 m in still water and then returns back to the point of start in total 10 minutes. Find the speed of his swim in
(i) ms^{-1}
(ii) kmh^{-1}.
Solution:
Distance swimed by a boys of 200 m + 200 m = 400 m
Time taken = 10 minutes

$$(i)\ \therefore \text{His speed in m s}^{-1} = \frac{400}{10 \times 60}$$

$$= \frac{2}{3} \text{ m s}^{-1}$$

$$(ii)\ \text{Speed in km h}^{-1} = \frac{2}{3} \times \frac{3600}{1000} = \frac{24}{10}$$

$$= 2.4 \text{ km h}^{-1}$$

Question 10.
A distance of 14.4 km is covered in 2 horus 40 minutes. Find the speed in ms^{-1}. With this speed Sakshi goes to her school, 240 m away from her house and then returns back. How much time, in all, will Sakshi take?
Solution:
Distance = 14.4 km
Time taken to cover = 2 hrs 40 min
= $2\frac{2}{3} = \frac{8}{3}$ hrs

(*i*) $\therefore$ Speed in m/s $= \dfrac{14{\cdot}4 \times 1000}{\dfrac{8}{3} \times 3600}$

$= \dfrac{144 \times 1000 \times 3}{10 \times 8 \times 3600} = \dfrac{3}{2}$ m s^{-1}

$= 1{\cdot}5$ m s^{-1}

(*ii*) Distance from house to school and back
$= 240 + 240 = 480$ m

$\therefore$ Time taken $= \dfrac{480}{1{\cdot}5}$ second

$= \dfrac{480 \times 10}{15} = 320$ seconds

$= \dfrac{320}{60}$ min $= 50$ min 20 sec