Pair of Linear Equations in Two varibles Ex 3.10 Q9

Answer :

Let x and y be two cars starting from points A and B respectively.
Let the speed of the car X be x km/hr and that of the car Y be y km/hr.
Case I: When two cars move in the same directions:
Suppose two cars meet at point Q, then,
Distance travelled by car X = AQ
Distance travelled by car Y = BQ
It is given that two cars meet in 8 hours.
Distance travelled by car X in 8 hours = $8x$ km
AQ= $8x$
Distance travelled by car Y in 8 hours = $8y$ km
BQ = $8y$
Clearly AQ-BQ = AB

$$8x-8y=80$$

Both sides divided by 8, we get

$$x-y=10\cdots(i)$$

Case II: When two cars move in opposite direction
Suppose two cars meet at point P, then,
Distance travelled by X car X=AP
Distance travelled by Y car Y=BP
In this case, two cars meet in 1 hour 20 minutes, we can write it as 1 hour $\frac{20}{60}$ or

$1\frac{1}{3}$ hours that is $\frac{4}{3}$ hours.

Therefore,

Distance travelled by car y in $\frac{4}{3}$ hours = $\frac{4}{3}x$ km

Distance travelled by car y in $\frac{4}{3}$ hours = $\frac{4}{3}y$ km

$$AP + BP = AB$$

$$\frac{4}{3}x + \frac{4}{3}y = 80$$

$$\frac{4}{3}(x+y) = 80$$

$$(x+y) = 80 \times \frac{3}{4}$$

$$x + y = 60 \quad \text{...(ii)}$$

By solving (i) and (ii) we get,

$$x - y = 10$$

$$\frac{x + y = 60}{2x = 70}$$

$$x = \frac{70}{2}$$

$$x = 35$$

By substituting $x = 35$ in equation (ii), we get

$$x + y = 60$$

$$35 + y = 60$$

$$y = 60 - 35$$

$$y = 25$$

Hence, speed of car X is $\boxed{35\ km/hr}$, speed of car Y is $\boxed{25\ km/hr}$.

Pair of Linear Equations in Two varibles Ex 3.10 Q10

Answer :

We have to find the speed of the boat in still water and speed of the stream

Let the speed of the boat in still water be x km/hr and the speed of the stream be y km/hr then

Speed upstream $=(x-y)km/hr$

Sped down stream $=(x+y)km/hr$

Now, Time taken to cover 12 km upstream $=\frac{12}{x-y}hrs$

Time taken to cover 40 km down stream $=\frac{40}{x+y}hrs$

But, total time of journey is 8 hours

$$\frac{12}{x-y}+\frac{40}{x+y}=8\cdots(i)$$

Time taken to cover 16 km upstream $=\frac{16}{x-y}hrs$

Time taken to cover 32 km down stream $=\frac{32}{x+y}hrs$

In this case total time of journey is given to $8hrs$

$$\frac{16}{(x-y)}+\frac{32}{(x+y)}=8 \quad \text{...(ii)}$$

By $\frac{1}{x-y}=u$ and $\frac{1}{x+y}=v$ in equation (i) and (ii) we get

$$12u+40v=8$$

$$16u+32v=8$$

$$12u+40v-8=0\cdots(iii)$$

$$16u+32v-8=0\cdots(iv)$$

Solving these equations by cross multiplication we get

$$\frac{u}{40\times-8-32\times-8}=\frac{-v}{12\times-8-16\times-8}=\frac{1}{12\times32-16\times40}$$

$$\frac{u}{-320+256}=\frac{-v}{-96+128}=\frac{1}{384-640}$$

$$\frac{u}{-64}=\frac{-v}{32}=\frac{1}{-256}$$

$$u=\frac{\not-64}{\not-256} \text{ and } v=\frac{\not-32}{\not-256}$$

$$u=\frac{1}{4} \text{ and } v=\frac{1}{8}$$

Now,

$$u=\frac{1}{x-y}$$

$$\frac{1}{x-y}=\frac{1}{4}$$

$$4=x-y\cdots(v)$$

and

$$v=\frac{1}{x+y}$$

$$\frac{1}{x+y}=\frac{1}{8}$$

$$x+y=8\cdots(vi)$$

By solving equation (v) and (vi) we get,

$$x-y=4$$

$$\frac{x+y=8}{2x=12}$$

$$x=\frac{12}{2}$$

$$x=6$$

By substituting $x=6$ in equation (vi) we get

$$x+y=8$$

$$6+y=8$$

$$y=8-6$$

$$y=2$$

Hence, the speed of boat in still water is $\boxed{6\ km/hr}$,

The speed of the stream is $\boxed{2\ km/hr}$.

********** END **********