



Pair of Linear Equations in Two variables 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

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

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 x 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

$$AP + BP = AB$$

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

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

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

$$x + y = 60 \quad \dots (ii)$$

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

$$x - y = 10$$

$$x + y = 60$$

$$\hline 2x = 70$$

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

$$x = 35$$

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 35 km/hr , speed of car Y is 25 km/hr .

Pair of Linear Equations in Two variables 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

Speed 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

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

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 8 hrs

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

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

$$12u + 40v = 8$$

$$16u + 32v = 8$$

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

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

Solving these equations by cross multiplication we get

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

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

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

$$u = \frac{\cancel{-64}}{\cancel{-256}} \text{ and } v = \frac{\cancel{-32}}{\cancel{-256}}$$

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

Now,

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

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

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

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,

$$x - y = 4$$

$$x + y = 8$$

$$2x = 12$$

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

$$x = 6$$

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 $\boxed{6 \text{ km/hr}}$,

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

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