

Exercise 3E

Question 40:

Let the speed of train and car be x km/hr and y km/hr respectively.

Then,

$$\frac{250}{x} + \frac{120}{y} = 4$$

$$\Rightarrow \frac{125}{x} + \frac{60}{y} = 2$$
when, $\frac{1}{x} = u$ and $\frac{1}{y} = v$

$$\Rightarrow 125u + 60v = 2 - ---(1)$$
and,
$$\frac{130}{x} + \frac{240}{y} = 4 + \frac{18}{60} = 4 + \frac{3}{10} = \frac{43}{10}$$

$$\Rightarrow \frac{1300}{x} + \frac{2400}{y} = 43$$

Multiplying (1) by 40 and (2) by 1, we get

$$5000u + 2400v = 80 - (3)$$

 \Rightarrow 1300u + 2400 v = 43 - - -(2)

$$1300u + 2400v = 43 - (4)$$

subtracting (4) from (3), we get

$$\begin{array}{c} 3700u = 37 \\ u = \frac{1}{100} \end{array}$$

Putting $u = \frac{1}{100}$ in (1), we get

$$125 \times \frac{1}{100} + 60 \text{v} = 2 \Rightarrow 6000 \text{v} = 200 - 125 \Rightarrow \text{v} = \frac{1}{80}$$

$$\therefore u = \frac{1}{100} \Rightarrow \frac{1}{x} = \frac{1}{100} \Rightarrow x = 100$$

$$v = \frac{1}{80} \Rightarrow \frac{1}{y} = \frac{1}{80} \Rightarrow y = 80$$

Hence, speeds of the train and the car are 100km/hr and 80 km/hr respectively.

Question 41:

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

Then,

Speed upstream = (x - y)km/hr

Speed downstream = (x + y) km/hr

Time taken to cover 12 km upstream = $\frac{12}{x-y}hrs$ Time taken to cover 40 km downstream = $\frac{40}{x+y}hrs$ Total time taken = 8hrs

$$\therefore \frac{12}{x-y} + \frac{40}{x+y} = 8$$

Again, time taken to cover 16 km upstream = $\frac{16}{x-y}$

Time taken to taken to cover 32 km downstream = $\frac{32}{x+y}$ Total time taken = 8hrs

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

Putting
$$\frac{1}{(x-y)} = u$$
 and $\frac{1}{(x+y)} = v$, we get

$$12u + 40v = 8$$

$$3u + 10v = 2 - (1)$$

and

$$16u + 32v = 8$$

$$2u + 4v = 1 - (2)$$

Multiplying (1) by 4 and (2) by 10, we get

$$12u + 40v = 8 - (3)$$

$$20u + 40v = 10 - (4)$$

Subtracting (3) from (4), we get

$$8u = \frac{1}{4}$$

Putting $u = \frac{1}{4}$ in (3), we get

$$3 \times \frac{1}{4} + 10v = 2 \Rightarrow 10v = \frac{5}{4} \Rightarrow v = \frac{1}{8}$$

$$u = \frac{1}{4} \Rightarrow \frac{1}{x - y} = \frac{1}{4} \Rightarrow x - y = 4 - - - (5)$$

$$v = \frac{1}{8} \Rightarrow \frac{1}{x + y} = \frac{1}{8} \Rightarrow x + y = 8 - - - (6)$$

On adding (5) and (6), we get

$$2x = 12$$

Putting x = 6 in (6) we get

$$6 + y = 8$$

$$y = 8 - 6 = 2$$

$$x = 6, y = 2$$

Hence, the speed of the boat in still water = 6 km/hr and speed of the stream = 2km/hr

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