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

$$\Rightarrow 125u+60v=2 \quad ---(1)$$

and,

$$\frac{130}{x}+\frac{240}{y}=4+\frac{18}{60}=4+\frac{3}{10}=\frac{43}{10}$$

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

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

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

$5000u + 2400v = 80$ —(3)

$1300u + 2400v = 43$ —(4)

subtracting (4) from (3), we get

$$3700u = 37$$

$$u = \frac{1}{100}$$

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

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

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

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

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

$12u + 40v = 8$

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

and

$16u + 32v = 8$

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

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

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

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

Subtracting (3) from (4), we get

$8u = 2$

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

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

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

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

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

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

$2x = 12$

$x = 6$

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

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