



### Pair of Linear Equations in Two variables Ex 3.10 Q11

**Answer :**

Let the speed of the train be  $x$  km/hour that of the bus be  $y$  km/hr, we have the following cases

Case I: When Roohi travels 300 Km by train and the rest by bus

$$\text{Time taken by Roohi to travel 60 Km by train} = \frac{60}{x} \text{ hrs}$$

$$\text{Time taken by Roohi to travel } (300-60) = 240 \text{ Km by bus} = \frac{240}{y} \text{ hrs}$$

$$\text{Total time taken by Roohi to cover 300Km} = \frac{60}{x} + \frac{240}{y}$$

It is given that total time taken in 4 hours

$$\frac{60}{x} + \frac{240}{y} = 4$$

$$60 \left( \frac{1}{x} + \frac{4}{y} \right) = 4$$

$$\left( \frac{1}{x} + \frac{4}{y} \right) = \frac{4}{60}$$

$$\frac{1}{x} + \frac{4}{y} = \frac{1}{15} \dots (i)$$

Case II: When Roohi travels 100 km by train and the rest by bus

$$\text{Time taken by Roohi to travel 100 Km by train} = \frac{100}{x} \text{ hrs}$$

$$\text{Time taken by Roohi to travel } (300-100) = 200 \text{ Km by bus} = \frac{200}{y} \text{ hrs}$$

In this case total time of the journey is 4 hours 10 minutes

$$\frac{100}{x} + \frac{200}{y} = 4 \text{ hrs } 10 \text{ minutes}$$

$$\frac{100}{x} + \frac{200}{y} = 4 \frac{10}{60}$$

$$\frac{100}{x} + \frac{200}{y} = 4 \frac{1}{6}$$

$$\frac{100}{x} + \frac{200}{y} = \frac{25}{6}$$

$$100 \left( \frac{1}{x} + \frac{2}{y} \right) = \frac{25}{6}$$

$$\frac{1}{x} + \frac{2}{y} = \frac{25}{6} \times \frac{1}{100}$$

$$\frac{1}{x} + \frac{2}{y} = \frac{1}{24} \dots (i)$$

Putting  $\frac{1}{x} = u$  and  $\frac{1}{y} = v$ , the equations (i) and (ii) reduces to

$$1u + 4v = \frac{1}{15} \dots (iii)$$

$$1u + 2v = \frac{1}{24} \dots (iv)$$

Subtracting equation (iv) from (iii) we get

$$u + 4v = \frac{1}{15}$$

$$-u - 2v = -\frac{1}{24}$$

$$\hline 2v = \frac{1}{15} - \frac{1}{24}$$

$$2v = \frac{24-15}{360}$$

$$2v = \frac{9}{360}$$

$$v = \frac{1}{40} \times \frac{1}{2}$$

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

Putting  $v = \frac{1}{80}$  in equation (iii), we get

$$u + 4v = \frac{1}{15}$$

$$u + 4 \times \frac{1}{80} = \frac{1}{15}$$

$$u + \frac{4}{80} = \frac{1}{15}$$

$$u = \frac{1}{15} - \frac{4}{80}$$

$$1u = \frac{1}{15} - \frac{1}{20}$$

$$1u = \frac{20-15}{300}$$

$$1u = \frac{5}{300}$$

$$u = \frac{1}{60}$$

Now

$$u = \frac{1}{60}$$

$$\frac{1}{x} = \frac{1}{60}$$

$$x = 60$$

and

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

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

$$y = 80$$

Hence, the speed of the train is  $\boxed{60 \text{ km/hr}}$  .

The speed of the bus is  $\boxed{80 \text{ km/hr}}$  .

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