



### Pair of Linear Equations in Two variables Ex 3.10 Q14

**Answer :**

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

Case I: When Abdul travels 300 Km by train and the 200 Km by taxi

$$\text{Time taken by Abdul to travel 300 Km by train} = \frac{300}{x} \text{ hrs}$$

$$\text{Time taken by Abdul to travel 200 Km by taxi} = \frac{200}{y} \text{ hrs}$$

$$\text{Total time taken by Abdul to cover 500 Km} = \frac{300}{x} + \frac{200}{y}$$

It is given that total time taken in 5 hours 30 minutes

$$\frac{300}{x} + \frac{200}{y} = 5 \text{ hours } 30 \text{ minutes}$$

$$100 \left( \frac{3}{x} + \frac{2}{y} \right) = 5 \frac{30}{60}$$

$$100 \left( \frac{3}{x} + \frac{2}{y} \right) = 5 \frac{30}{60}$$

$$100 \left( \frac{3}{x} + \frac{2}{y} \right) = 5 \frac{1}{2}$$

$$100 \left( \frac{3}{x} + \frac{2}{y} \right) = \frac{11}{2}$$

$$\left( \frac{3}{x} + \frac{2}{y} \right) = \frac{11}{2} \times \frac{1}{100}$$

$$\frac{3}{x} + \frac{2}{y} = \frac{11}{200} \dots (i)$$

Case II: When Abdul travels 260 Km by train and the 240 km by taxi

$$\text{Time taken by Abdul to travel 260 Km by train} = \frac{260}{x} \text{ hrs}$$

$$\text{Time taken by Abdul to travel 240 Km by taxi} = \frac{240}{y} \text{ hrs}$$

In this case total time of the journey is 5 hours 36 minutes

$$\frac{260}{x} + \frac{240}{y} = 5 \text{ hrs } 36 \text{ minutes}$$

$$\frac{260}{x} + \frac{240}{y} = 5 \frac{36}{60}$$

$$\frac{260}{x} + \frac{240}{y} = 5 \frac{6}{10}$$

$$\frac{260}{x} + \frac{240}{y} = 5 \frac{3}{5}$$

$$20 \left( \frac{13}{x} + \frac{12}{y} \right) = \frac{28}{5}$$

$$\left( \frac{13}{x} + \frac{12}{y} \right) = \frac{28}{5} \times \frac{1}{20}$$

$$\frac{13}{x} + \frac{12}{y} = \frac{7}{25}$$

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

$$3u + 2v = \frac{11}{200} \dots (iii)$$

$$13u + 12v = \frac{7}{25} \dots (iv)$$

Multiplying equation (iii) by 6 the above system of equation becomes

$$18u + 12v = \frac{33}{100} \dots (v)$$

Subtracting equation (iv) from (v) we get

$$18u - 12v = \frac{33}{100}$$

$$-13u - 12v = -\frac{7}{25}$$

$$5u = \frac{33}{100} - \frac{7}{25}$$

$$5u = \frac{33}{100} - \frac{7 \times 4}{25 \times 4}$$

$$5u = \frac{33}{100} - \frac{28}{100}$$

$$5u = \frac{33 - 28}{100}$$

$$5u = \frac{5}{100}$$

$$u = \frac{5}{100} \times \frac{1}{5}$$

$$u = \frac{\cancel{5}}{100} \times \frac{1}{\cancel{5}}$$

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

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

$$3u + 2v = \frac{11}{200}$$

$$3 \times \frac{1}{100} + 2v = \frac{11}{200}$$

$$\frac{3}{100} + 2v = \frac{11}{200}$$

$$2v = \frac{11}{200} - \frac{3}{100}$$

$$2v = \frac{11}{200} - \frac{3 \times 2}{100 \times 2}$$

$$2v = \frac{11 - 6}{200}$$

$$2v = \frac{5}{200}$$

$$v = \frac{\cancel{5}}{\cancel{200}_{40}} \times \frac{1}{2}$$

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

Now

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

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

$$x = 100$$

and

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

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

$$y = 80$$

Hence, the speed of the train is  $\boxed{100 \text{ km/hr}}$ .

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

\*\*\*\*\* END \*\*\*\*\*