

CBSE HOTS X

After covering a distance of 30 km with uniform speed there is some defect in train engine and therefore its speed is reduced to  $\frac{4}{5}$  of its original speed and so the train reaches its destination late by 45 minutes. Had it happened after covering 18 km more the train would have reached 9 minutes earlier. Find speed of train and distance of journey.

Solution by Dev Anoop (bathinda)

$$\begin{aligned} \text{let original speed} &= 5x \text{ km/h} \\ \text{time} &= y \text{ h} \\ \therefore \text{distance} &= 5xy \text{ h} \end{aligned}$$

CI before defect

$$\begin{aligned} S &= 5x \text{ km/h} \\ d &= 30 \text{ km} \\ t &= \frac{d}{S} = \frac{30}{5x} \text{ h} \end{aligned}$$

after defect

$$\begin{aligned} S &= \frac{4}{5} \times 5x \\ &= 4x \text{ km/h} \\ d &= (5xy - 30) \text{ km} \\ t &= \frac{d}{S} = \frac{5xy - 30}{4x} \text{ h} \end{aligned}$$

$$\frac{30^6}{5x} + \frac{5xy - 30}{4x} = y + \frac{45^3}{60^4}$$

$$(\times 4x) \quad 24 + 5xy - 30 = 4xy + 3x$$

$$\Rightarrow xy - 3x = 6 \dots \textcircled{1}$$

CI before defect

$$\begin{aligned} S &= 5x \text{ km/h} \\ d &= 48 \text{ km} \\ t &= \frac{48}{5x} \text{ h} \end{aligned}$$

after defect

$$\begin{aligned} S &= 4x \text{ km/h} \\ d &= (5xy - 48) \text{ km} \\ t &= \frac{5xy - 48}{4x} \text{ h} \end{aligned}$$

$$\frac{48}{5x} + \frac{5xy - 48}{4x} = y + \frac{36^6}{60^{10}}$$

$$(\times 20x) \quad 192 + 25xy - 240 = 20xy + 12x$$

$$\Rightarrow 5xy - 12x = 48 \dots \textcircled{11}$$