① $A = 2B$

$B = 3C$, $C \rightarrow \boxed{90 \text{ min.}}$

$$A \longrightarrow 2B \longrightarrow 3C$$

~~$A = 3C$~~

$A = 6C$,   times $A = \dfrac{90}{6} = 15 \text{ min.}$

$$\boxed{\text{Answer} = 15 \text{ min}}$$

② $S = 300 \text{ m/sec} = 0.3 \text{ km/sec}$

1 sec. distance Covered = 0.3 km.

$\therefore$ 10 sec _____ = 0.3 km $\times$ 10

= 3 km.

$$\boxed{\text{Answer} = 3 \text{ km}}$$

③ let $\rightarrow$ the distance $\rightarrow$ 1200 km.

$\dfrac{1}{3}$ part = $\dfrac{1}{3}(1200) = 400$ km.

$\dfrac{1}{4}$ part = $\dfrac{1}{4}(1200) = 300$ km

Remaining $\rightarrow$ 500 km.

Total distance = $1200\,km$.

Time Covered by the distance, (T)

$$t = \frac{d}{s}$$

$$T = \frac{\overset{16}{400}}{25} + \frac{\overset{10}{300}}{30} + \frac{\overset{10}{500}}{50}$$

$$\boxed{T = 36\,hr}$$

Average speed $= \dfrac{Total\ distance}{Total\ Time}$

$$= \frac{\overset{200\ 100}{1200}}{\underset{\underset{3}{3}}{36}} = \frac{100}{3}\ km/hr$$

$$\boxed{or = 33\tfrac{1}{3}\ km/hr}\quad \underline{Any}$$

(4)

$$\underset{A}{\overset{120\,km}{\longleftarrow}} \overset{P}{\underset{3x\,km/hr}{\bullet}} \overset{(d-120)}{\underset{2x\,km/hr}{\longrightarrow}} \underset{B}{\longrightarrow}(t+1.5hr)$$

$$\underset{}{\overset{100\,km}{\longleftarrow}}\overset{}{\underset{3\,km/hr}{}}\quad \overset{(d-180)}{\underset{Q\quad 2x\,km/hr}{\bullet}}\longrightarrow y$$
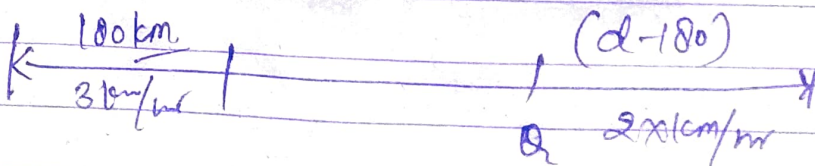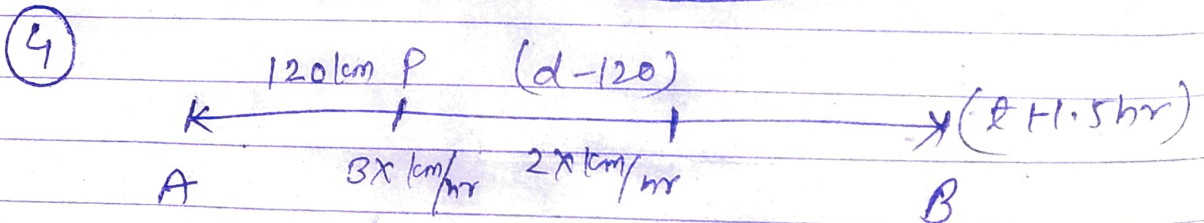
let the original speed = $\underline{3n \text{ km/hr}}$

if train met at point A,

$$\frac{120}{3x} + \frac{d-120}{2x} = \left(t + \frac{3}{2}\right) \quad - \text{①}$$

if train met point Q →

$$\frac{180}{3x} + \frac{d-180}{2x} = (t+1) \quad - \text{②}$$

Eqⁿ ① − Eqⁿ ②

$$\frac{d-120-d+180}{2x} + \frac{120-180}{3x} = \frac{1}{2}$$

$$\frac{60}{2x} - \frac{60}{3x} = \frac{1}{2}$$
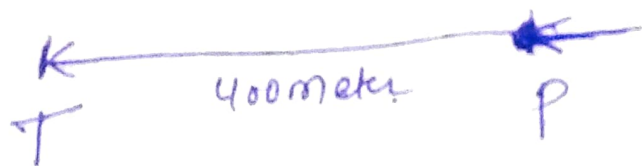
$$\frac{180\cancel{0} - 120\cancel{0}}{6x} = \frac{1}{2}$$

$$\frac{60\cancel{0}}{6x} = \frac{1}{2}$$

$$\frac{10}{x} = \frac{1}{2}$$

$$\boxed{x = 20}$$

So original Speed → $3x$ ⇒ $\boxed{60 \text{ km/hr}}$ A

(5)

$\overset{\text{K}}{\underset{\text{T}}{\longleftarrow}}$ 400 meter $\overset{\bigstar}{\underset{P}{\longleftarrow}}$

Relative speed $\Rightarrow$ $9 - 5 = 4 \text{ km/hr}$

$$= 4\left(\frac{5}{18}\right) \Rightarrow \frac{10}{9} \text{ m/sec}$$

Time taken in overtaking the thief $\Rightarrow$

$\underline{d = 400 \text{ m}}$

$\underline{\beta = \frac{10}{9} \text{ m/s}}$

$T = \dfrac{400 \times 9}{10} \Rightarrow \underline{360 \text{ sec}}$

Distance Covered by $\underline{\text{thief}}$ $\Rightarrow$

$D = \text{Speed} \times \text{time}$

$D = \dfrac{5 \times 5}{18} \times 360 \overset{2}{=} \underline{500 \text{ meter}}$

$\boxed{D = 500 \text{ meter} = 0.5 \text{ km}}$ $\underline{\text{Ans}}$