Exercise - 18 (K. C. Nag, Arithmetic)

(From this exercise sum no. 1-17 will be in your syllabus)

1. To pass a telegraph post the train has to travel its own length.

$\therefore$ 30 ~~km~~ $\times 1000$ m can be travelled in 60×60 sec

1 " " " " " $\frac{60 \times 60}{30 \times 1000}$ "

25 " " " " " $\frac{2 \times 6}{100} \times 25$ "

$= 3$ seconds.

$\therefore$ The train will pass the telegraph post in 3 seconds.

2. Let the length of the train be x m

To pass a platform a train has to cover its own length and the length of the platform together.

In 60×60 seconds the train can go 48×1000 m

" 1 second the train can go $\frac{48 \times 1000}{60 \times 60}$ "

" 30 seconds the train can go $\frac{48 \times 1000 \times 30}{60 \times 60}$ "

$= 80 \times 5$ m $= 400$ m

$\therefore$ The length of the train is $(400 - 250)$ m

$= 150$ m.

4. Let the length of the train be x m

$\therefore$ In 30 seconds the train can go $(220+x)$ m

" 1 second " " " " " $\frac{220+x}{30}$ m

Again, In 39 seconds the train can go $(325+x)$ m

" 1 second " " " " " $\frac{325+x}{39}$ "

$\therefore \frac{220+x}{30} = \frac{325+x}{39}$

or $220\times39 + 39x = 325\times30 + 30x$

or $39x - 30x = 325\times30 - 220\times39$

or $9x = 9750 - 8580 = 1170$

$\therefore x = \frac{1170}{9} = 130$

$\therefore$ The length of the train is 130 m.

$\therefore$ In 30 seconds the train can go $(220+130)$ m

" 1 second the train can go $\frac{350}{30}$ "

" 60×60 seconds " " " " $\frac{350\times60\times60}{30}$ "

$= 42000$ m

$\therefore$ The speed of the train is 42000 m/hr

or 42 km/hr.

6. Let the speeds of the two trains are x km/hr and y km/hr respectively.

When two trains run in the same direction, their relative speeds will be $(x-y)$ km/hr and when two trains run in the opposite direction, their relative speed will be $(x+y)$ km/hr.

In both cases they will have to covers $(100+95)$ m or 195 m.

When they are running in the same direction —

In 60×60 seconds they can go $(x-y)$ km

" 1 second " " " $\frac{(x-y)}{60\times60}$ "

" 27 seconds " " " $\frac{(x-y)}{60\times60}\times27$ "

When they are running in opposite direction —

In 60×60 seconds they can go $(x+y)$ km

" 1 second " " " $\frac{(x+y)}{60\times60}$ "

" 9 seconds " " " $\frac{(x+y)\times9}{60\times60}$ "

$$\therefore \frac{(x-y)\times\cancel{27}^{3}}{\cancel{60}\times\cancel{60}} = \frac{(x+y)\times\cancel{9}}{\cancel{60}\times\cancel{60}}$$

or $3x-3y = x+y$ or $x = 2y$

$$\therefore 1000\times\frac{(x-y)}{60\times60}\times27 = 195$$

or $1000\times\frac{(2y-y)}{60\times60}\times27 = 195$ or $27y = \frac{195\times60\times60}{1000}$

$$\therefore y = \frac{\cancel{195}^{39}\times\cancel{60}^{13}\times\cancel{60}^{2}}{\cancel{27}^{9}\times\cancel{1000}^{2}} = 26$$

∴ The speed of the second train is 26 km/hr and that of second train is $26\times2 = 52$ km/hr

8. When the man goes in the same direction of the train they will pass each other at a relative speed of $(61.6 - 8.8)$ km/hr $= 52.8$ km/hr.

When the man goes in the opposite direction of the train they will pass each other at a relative speed of $(61.6 + 8.8)$ km/hr

$= 70.4$ km/hr.

In both the cases to pass the man the train has to cover its own length, i.e. 176 m

i) When the man goes in the same direction:

52.8×1000 m can be covered in 60×60 seconds

1 " " " " " $\frac{60 \times 60}{52.8 \times 1000}$ "

176 " " " " " $\frac{60 \times 60 \times 176}{52.8 \times 1000}$ "

$= 12$ seconds.

∴ The train will take 12 seconds to pass the man when the man goes in the same direction

ii) When the man goes in the opposite direction:

70.4×1000 m can be covered in 60×60 seconds

1 " " " " " $\frac{60 \times 60}{70.4 \times 1000}$ "

176 " " " " " $\frac{60 \times 60 \times 176}{70.4 \times 1000}$ " $= 9$ sec.

∴ The train will take 9 seconds to pass the man when he goes in the opposite direction.