IFAS CSIR NET

MOVING OBJECT DYNAMICS

Moving Object Dynamics

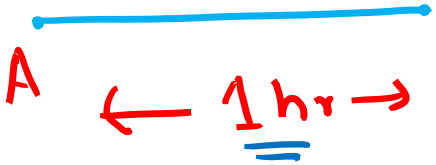
Speed

Distance

Time

(i) Distance = const

$\checkmark$ Speed $\propto \frac{1}{\text{Time}}$

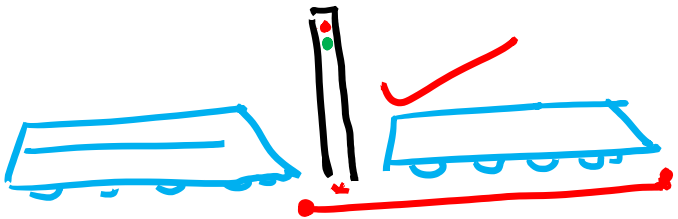


Time = Const.

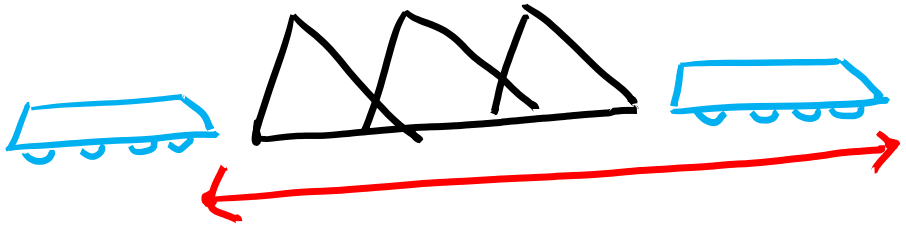
Speed $\propto$ Distance

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

*** TRAIN PROBLEMS ***



Distance covered by the train = the length of the train.



Distance covered by the train

= Length of the bridge + Length of the train

Q.1 A train 240 m long passed a pole on the platform in 12 sec. The platform has a total length of 560 m, how much time the train will take to pass the entire platform?

(1) 40 sec (2) 50 sec

(3) 60 sec (4) 70 sec

Sum:

12 sec — 240 m

⇒ 1 sec — $\frac{240}{12}$ m = 20 m

Total 240 + 800 = 800 m

Time = $\frac{800}{20}$ sec

= 40 sec

Q.2 Two trains 140 m and 160 m long run at the speed of 60 km/hr and 40 km/hr respectively in opposite direction on parallel tracks. The time (in sec) which the trains take to cross each other is

(1) 9 sec

(2) 9.6 sec

(3) 10 sec

(4) 10.8 sec

** Relative Speed

U km/hr → Opposite direction,

← V km/hr Relative speed = (U+V) km/hr.

U km/hr →

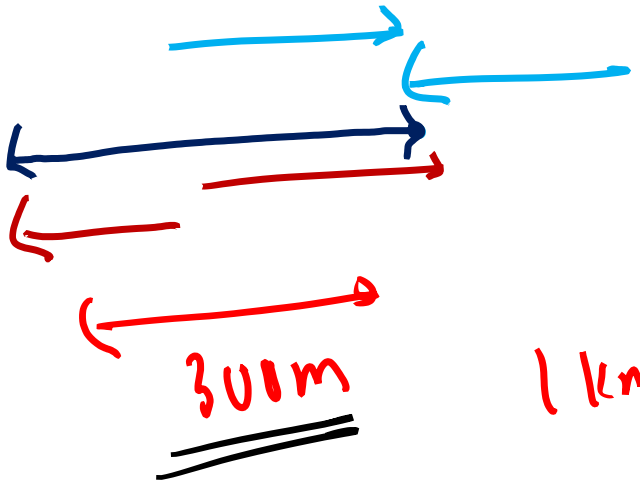
U > V Relative speed

→ V km/hr = (U - V) km/hr.

Sol^n Relative speed = (40 + 60) km/hr

= 100 km/hr.

= 100 × 5/18 m/s



1 km/hr = 1000 m / 3600 sec

= 5/18 m/s

$$S = \frac{D}{T}, \quad T = \frac{D}{S}$$

$$= \frac{300}{100 \times \frac{5}{18}} \times 3 \text{ sec}$$

$$= 3 \times \frac{18}{5} \text{ sec}$$

$$= \frac{54}{5} \text{ sec}$$

$$= 10.8 \text{ sec}$$

Q.3 (CLIK)

Train → x km/hr.
Man ← 5 km/hr
Rel speed = x − 5 km

A train 125 m long passes a man, running at 5 km/hr in the same direction in which the train is going, in 10 seconds. The speed of the train is:

(1) 45 km/hr
(2) 50 km/hr
(3) 54 km/hr
(4) 55 km/hr.

Sum. Relative Speed = Distance / Time

$= \frac{125 \text{ m}}{10 \text{ sec}}$

$= \frac{125}{10} \times \frac{18}{5}$ km/hr

$= 45$ km/hr.

Actual speed

$= (45 + 5)$ km/hr.

$= 50$ km/hr

(SSC)

Q 4 The train travelling at 48 km/hr. completely crosses another train having half its length and travelling in opposite direction at 42 km/hr. in 12 sec. It also passes a railway platform in 45 sec. The length of the platform is

(1) 400 m (2) 450 m (3) 540 m (4) 600 m

Sol^n: Relative speed = (48+42) km/hr

= 90 km/hr

= 90 × $\frac{5}{18}$ m/s

= 25 m/sec

1 s — 25 m

12 s — 25×12 m

= 300 m

$x + \frac{x}{2}$ = 300 m ⇒ $\frac{3x}{2}$ = 300

⇒ x = 200 m.

$48\ km/hr = 48 \times \frac{5}{18}\ m/s.$

$1\ s \longrightarrow 48 \times \frac{5}{18}\ m$

$\therefore 45\ s \longrightarrow 24 \cancel{48} \times \frac{5}{\cancel{18}} \times \cancel{45}^{5}\ m$

$= 600\ m.$

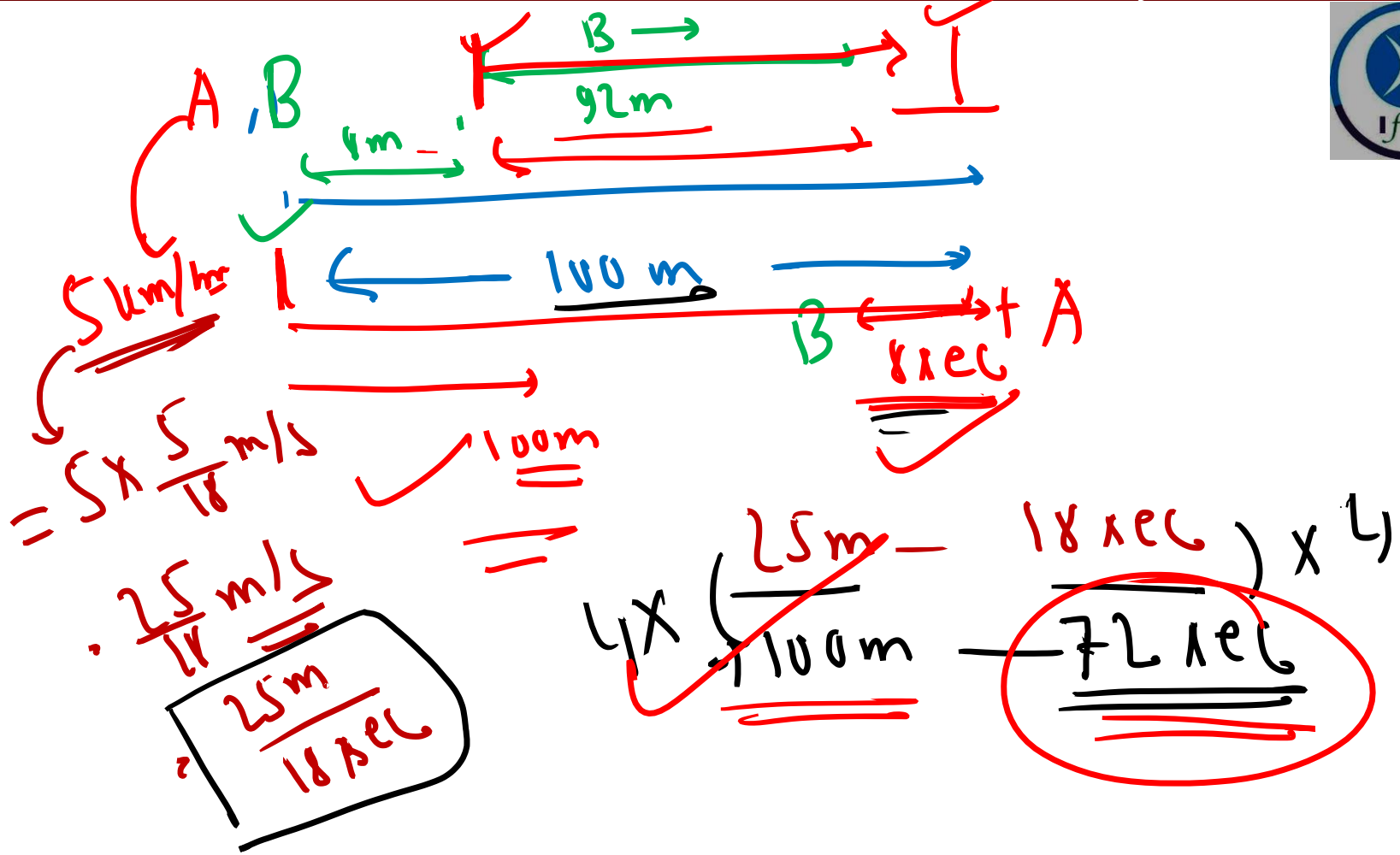
Q.5 A and B take part in a 100 m race. A runs at 5 km/hr. A gives B a start of 8 m and still beats by 8 secs. The speed of B is

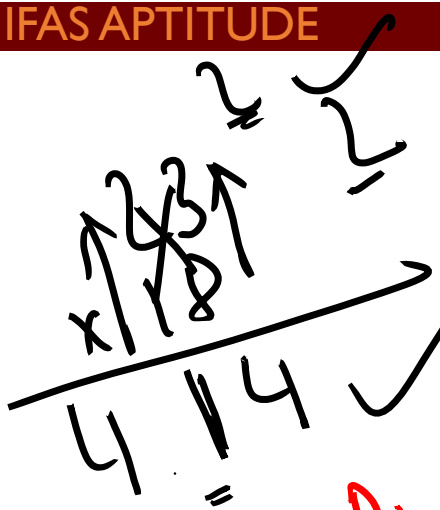
(1) 5.15 kmph

(2) 4.14 kmph

(3) 4.25 kmph

(4) 4.4 kmph

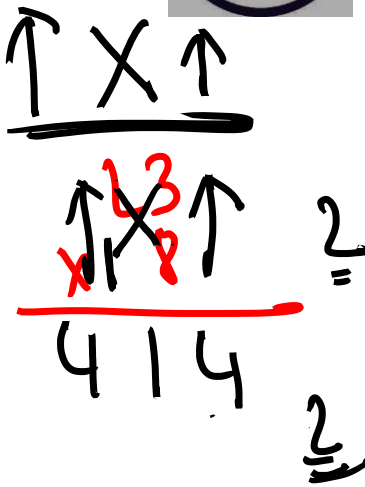

A, B
B
92m
4m
100 m
B
A
8 sec
54 km/hr
= 5 × 5/18 m/s
100m
25/18 m/s
25m / 18 sec
4 × (25m / 100m — 18 sec / 72 sec) × 4



16+3=19 +2=21

B — Time = (72+8) sec

= 80 sec.



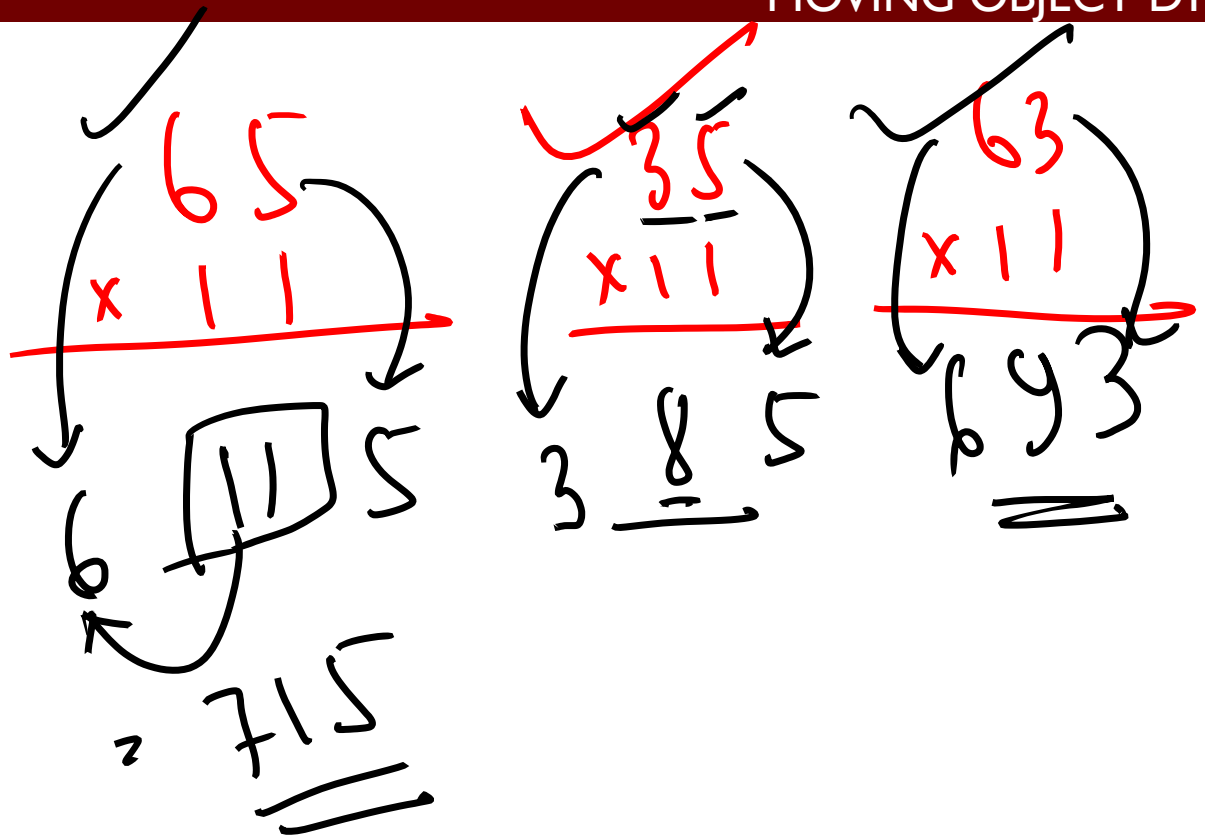
Distance = 92m

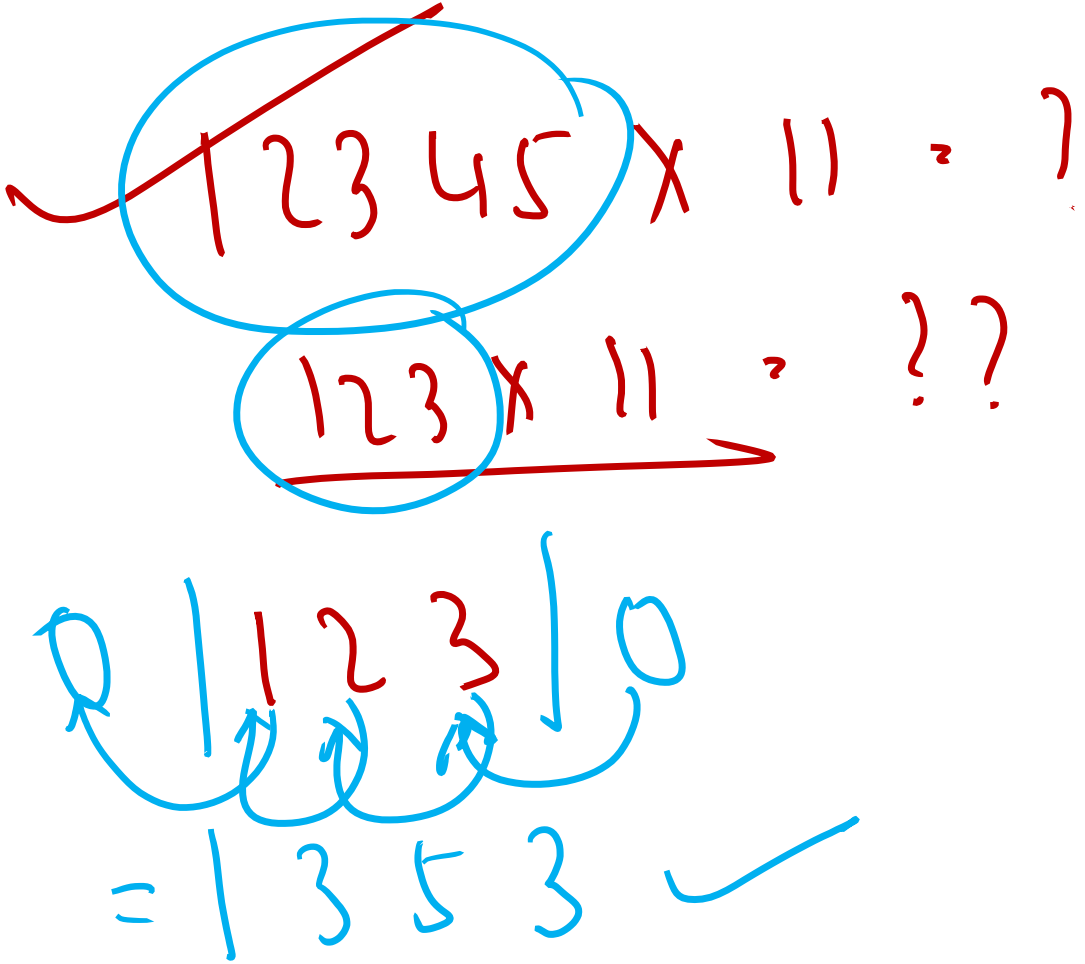
Speed = $\frac{92}{80}$ m/s

$\frac{23 \times 18}{100} = \frac{414}{100}$ .414

$\frac{23}{20}$ $\frac{92}{80} \times \frac{18}{5}$ km/hr

16+3 = 19


65
x 11
715
35
x 11
385
63
x 11
693


12345 x 11 = ?
123 x 11 = ??
1 1 2 3 0
= 1 3 5 3

$$
\begin{array}{r}
135795 \\
\times\ 135795 \\
\hline
102275 \\
\hline
\end{array}
$$

1 3 5 7 9 5

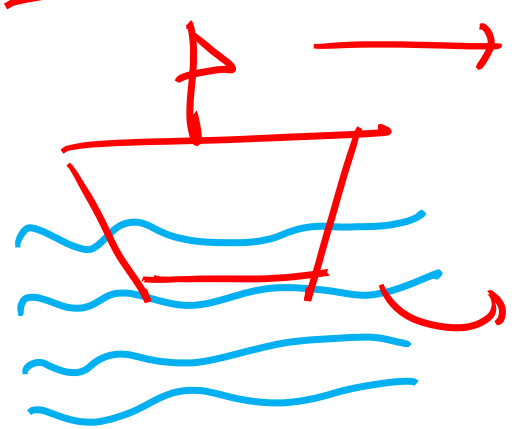
1 4 9 3 7 4 5

1 4

17

19

Boat Problems



Down stream speed = (7+5) km/hr.

Up stream speed = (7-5) km/hr

Q1 A boat can travel with a speed of 13 km/hr in still water. If the speed of the stream is 4 km/hr. Find the time taken by the boat to go 68 km downstream.

(1) 3 hrs (2) 4 hrs (3) 8 hrs (4) none

13+4 km/m = 17 km/m.

1 m — 17 km

$\frac{68}{17}$ m — 68 Km

4 m

Q.1 The speed of a boat in still water is 15 km/hr. and the rate of current is 3 km/hr. The distance travelled downstream in 12 mins is.

(1) 1.2 km

(2) 1.8 km

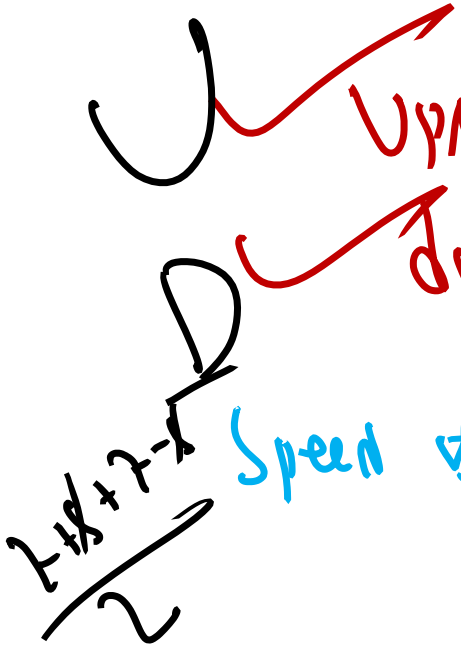
(3) 3.1 km

(4) 2.4 km

60 min – 18 km

12 min – $\frac{18}{5}$ km

= 3.6 km



Upstream stream = (7 − 5) km/hr

Downstream stream = (7 + 5) km/hr

Speed of boat in still water (7) = $\frac{U+D}{2}$ km/hr

Speed of the current (5) = $\frac{D-U}{2}$ km/hr

(SR) Q. A man swims downstream 30 km (10 km/hr) and upstream 18 km (6 km/hr) taking a time of 3 hrs each. (a) what is the velocity of the current? (5)

(b) what is the speed of the man? (2)

Ans (a) 2 km/hr (b) 8 km/hr

10 - 6 km/hr

2

HAPPY LEARNING

THANKS

Mon - Sat

4:30PM
Gen Aptitude
1 3hrs