TSD

* T, S, D

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

Avg. Speed

(i)

$$\text{Avg. Speed} = \frac{T \cdot D \cdot T}{T \cdot T \cdot T}$$

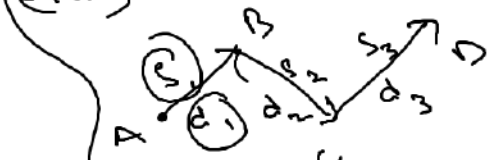
$$\text{Avg. Speed} = \frac{d_1 + d_2 + d_3}{t_1 + t_2 + t_3}$$

(ii)

$d_1 = S_1 t_1$

$$\text{Avg. Speed} = \frac{T \cdot D \cdot T}{T \cdot T \cdot T} = \frac{S_1 t_1 + S_2 t_2 + S_3 t_3}{t_1 + t_2 + t_3}$$

(iii)



$$\text{Avg. Speed} = \frac{d_1 + d_2 + d_3}{\frac{d_1}{S_1} + \frac{d_2}{S_2} + \frac{d_3}{S_3}}$$

54 km/hr $\times \frac{5}{18}$ m/s $\times \frac{18}{5}$ km/hr

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

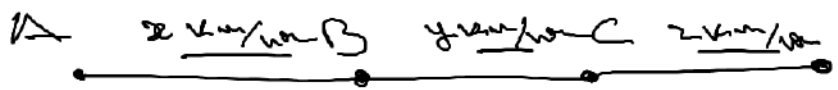
Q.

AB = BC

Avg. Speed = ?

$$\frac{2 \cdot D \cdot T}{T \cdot T \cdot T} = \frac{d + d}{\frac{d}{x} + \frac{d}{y}} = \frac{2y}{x\left(\frac{1}{x} + \frac{1}{y}\right)} = \frac{2xy}{x+y}$$

Q.



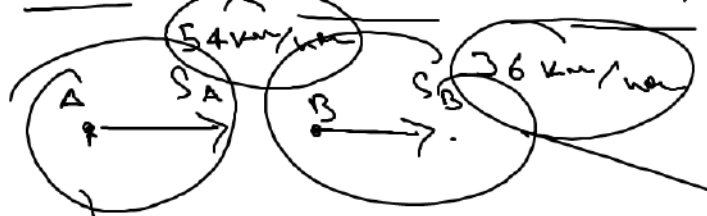
AB = BC = CD

Avg. Speed = ?

$$\frac{3xyz}{xy+yz+zx}$$

Relative motion → o.n.f

(i) when two bodies move in same direc^{n}



$R.S = S_A - S_B$

$R.S = S_B - S_A$

R.S

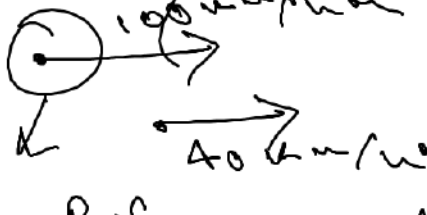
10 km/hr

100 km

90 km

80 km

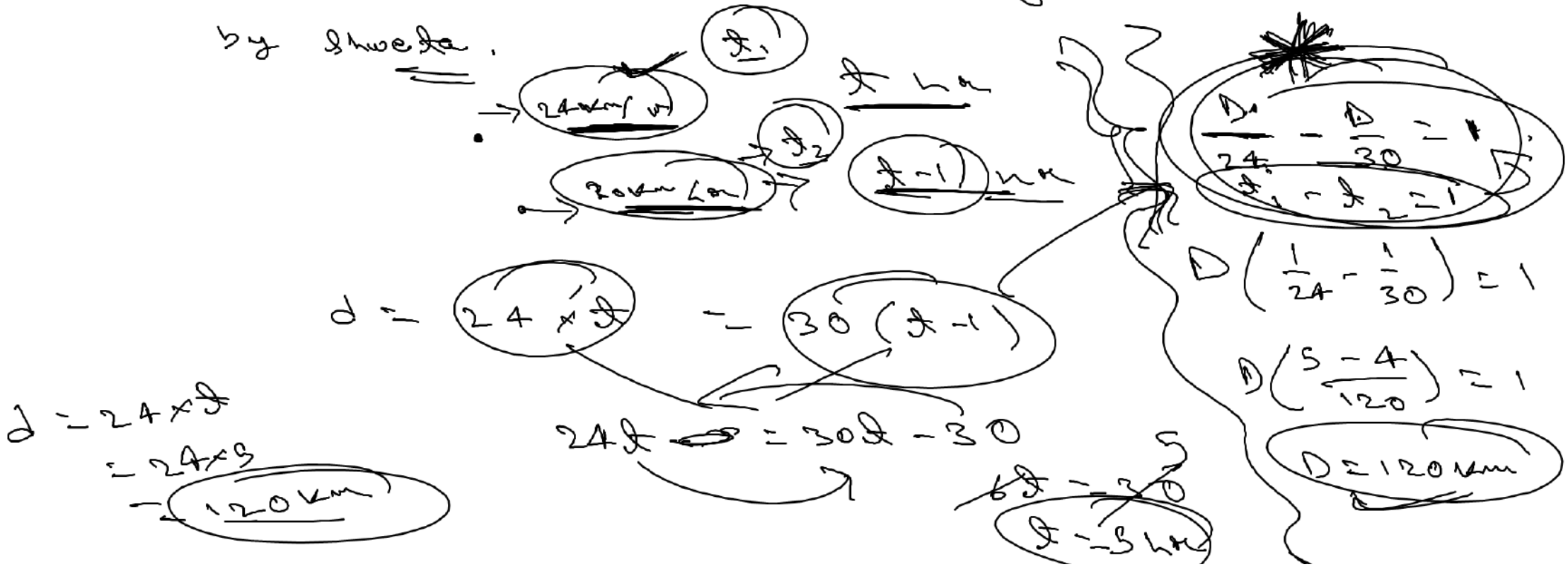
70 km



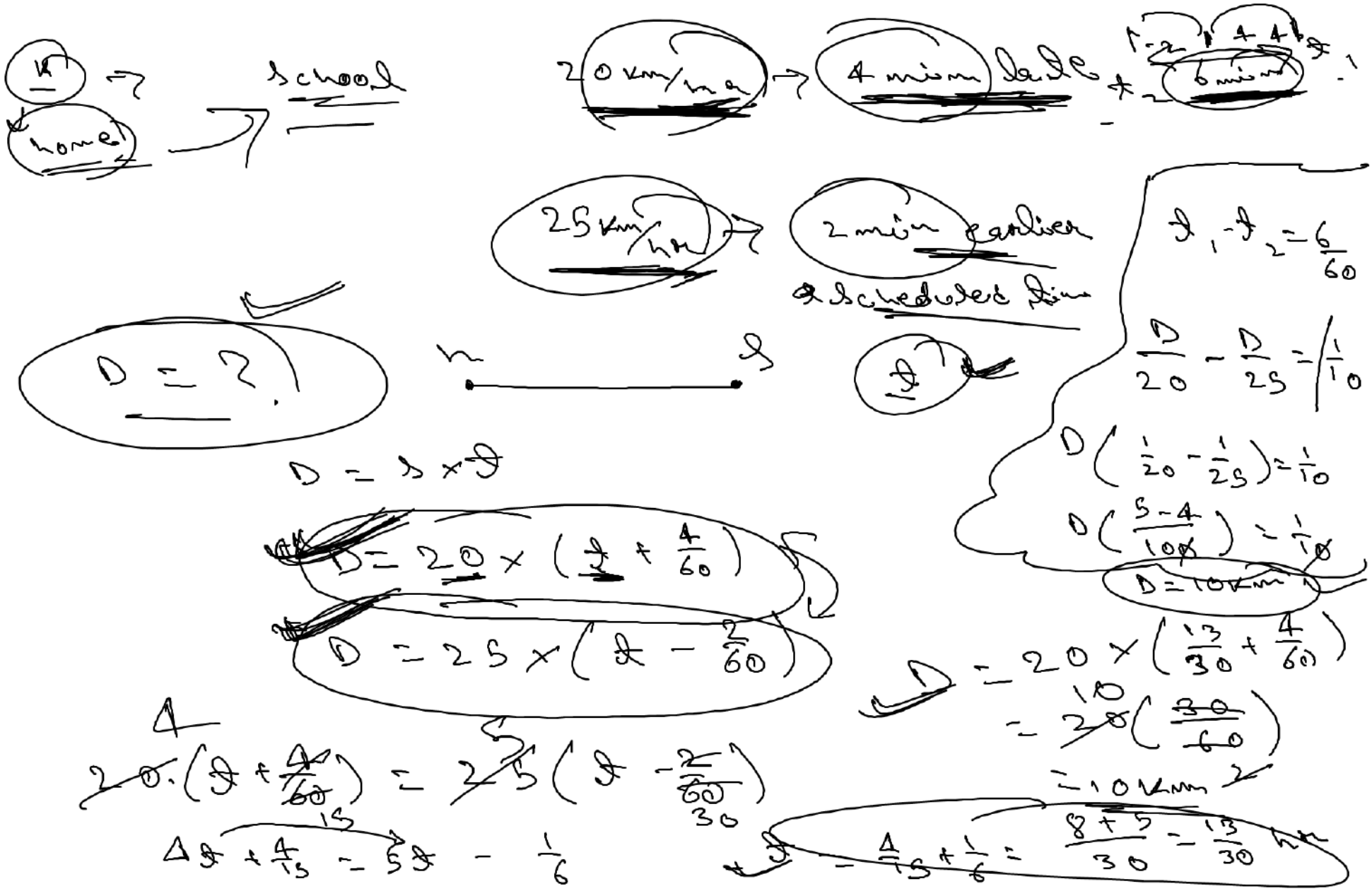
R.S = 100 - 40

= 60 km

Q. Shweta when increased her speed from 24 km/hr to 30 km/hr she takes one hour less than the usual time to cover a certain distance. What is the distance usually covered by Shweta.



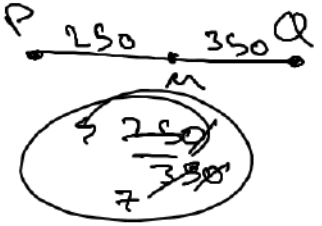
Q.

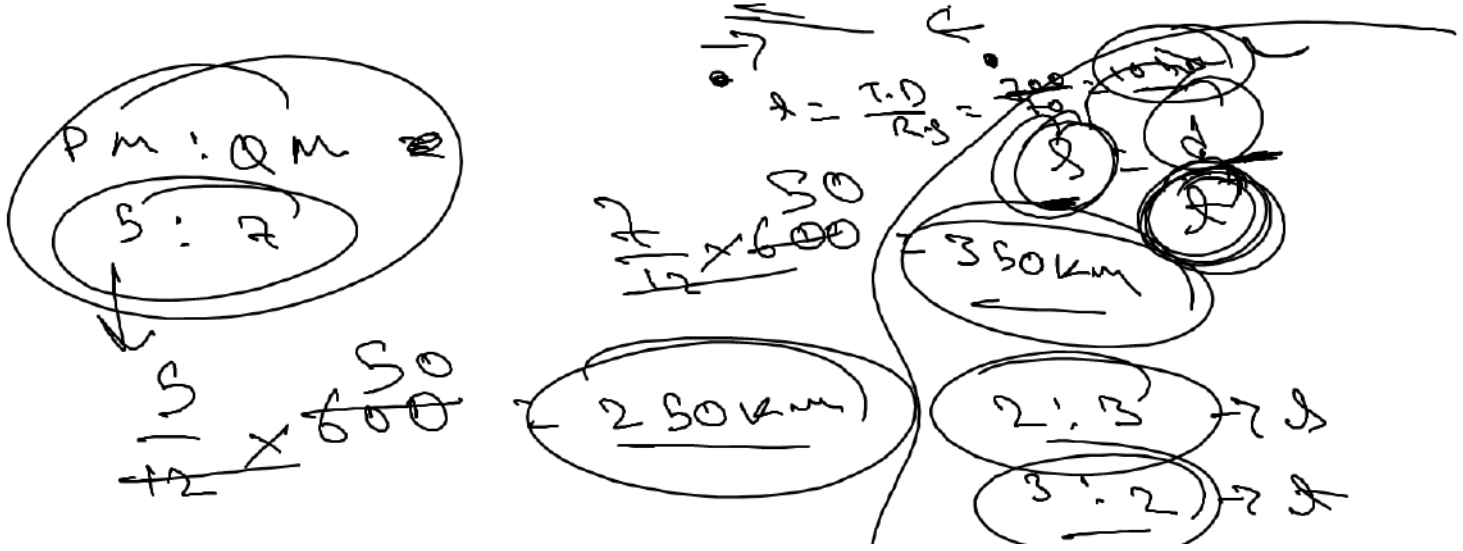

K
home
school
20 km/hr
4 min late
6 min
25 km/hr
2 min earlier
scheduled time
D = ?
D = s × t
D = 20 × (t + 4/60)
D = 25 × (t − 2/60)
20(t + 4/60) = 25(t − 2/60)
20t + 4/3 = 25t − 5/6
5t = 4/3 + 5/6
= 8 + 5 / 30
= 13/30 hr
D = 20 × (13/30 + 4/60)
= 20 × (30/60)
= 10 km
t1 − t2 = 6/60
D/20 − D/25 = 1/10
D(1/20 − 1/25) = 1/10
D((5 − 4)/100) = 1/10
D = 10 km

Q.11 A & B started simultaneously towards each other from P & Q resp. The distance b/w P and Q is 600 km. and the ratio of speeds of A is to B is 5:7. If they meet at pt. M

(i) find the ratio of PM:QM

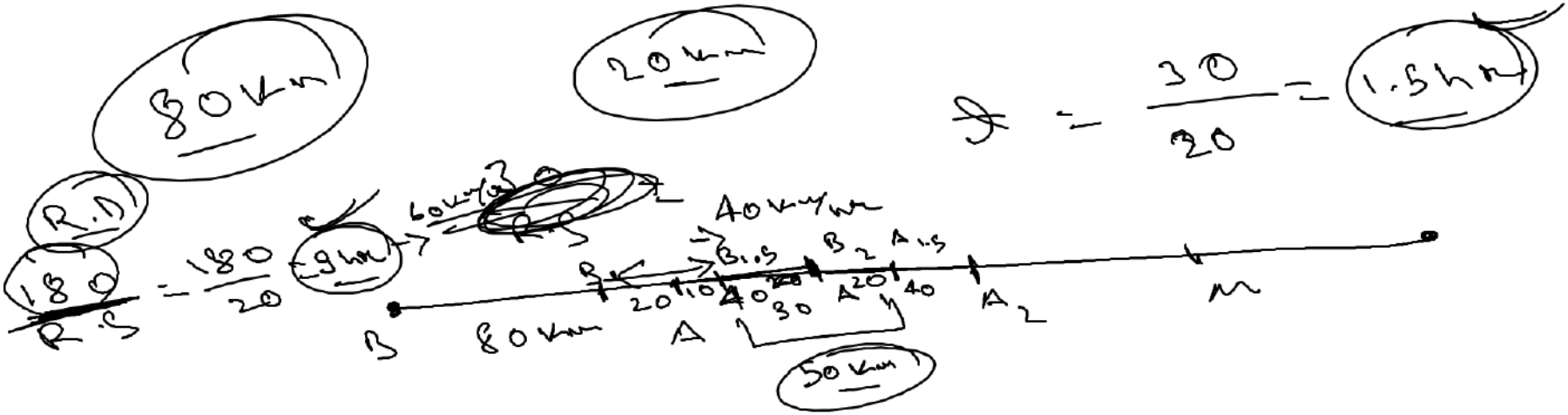
(ii) Find the distance PM.



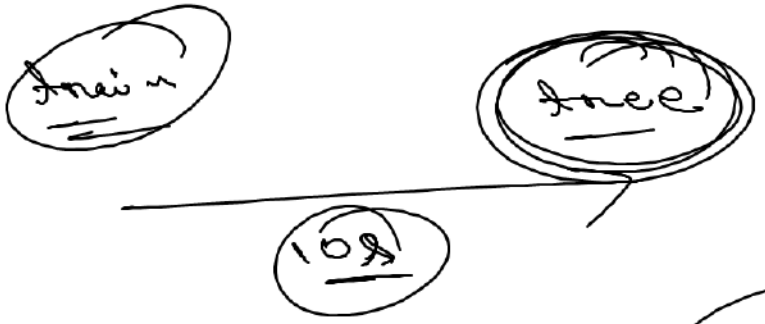


$$t = \frac{280}{70} = 4\text{ hr}$$

$$t = \frac{30}{20} = 1.5\text{ hr}$$



Q.



train length = 150m

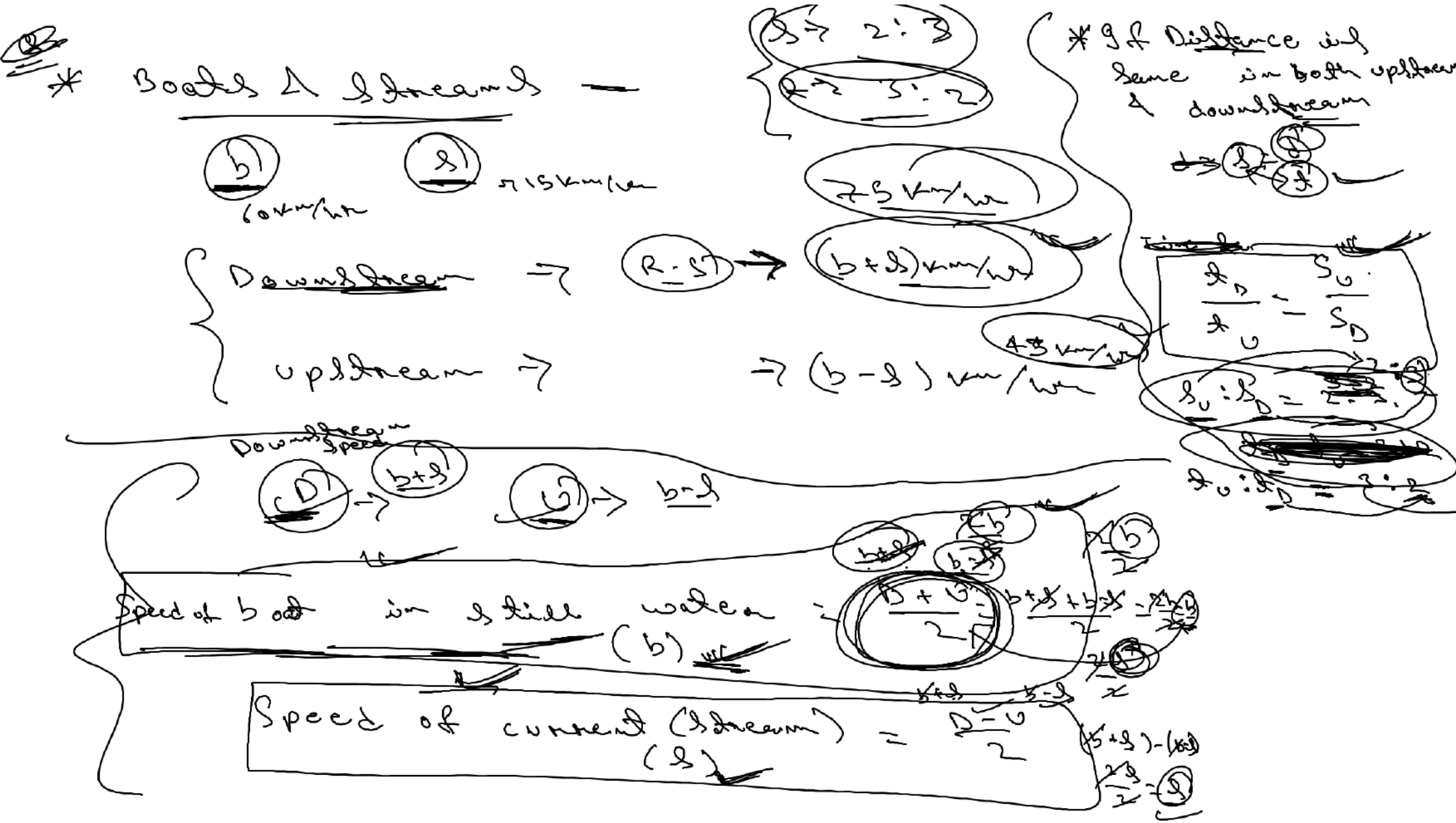
Speed of train → $\frac{150}{10} = 15\,m/s$

Q. train length → 250m bridge length → 150m

Speed of train

cross 20s

$\frac{250+150}{20} = \frac{400}{20} = 20\,m/s$


* Boats & Streams
b
s
60 km/hr
15 km/hr
Downstream → R + S → (b+s) km/hr
upstream → (b-s) km/hr
Downstream speed
b+s
b-s
Speed of boat in still water = (b)
Speed of current (stream) = (s)
* If Difference in same in both upstream & downstream

Q. 24.

$$\frac{D}{s_1+1} + \frac{D}{s_1-1} = \frac{80}{60}$$

$$\frac{D}{6} + \frac{D}{4} = \frac{4}{3}$$

$$D\left(\frac{2+3}{12}\right) = \frac{4}{3}$$

$$D = \frac{16}{5} \text{ km} = 3.2 \text{ km}$$

(i) AB = ?

(ii) ratio of $\frac{s_D}{s_U}$ = ?

(iii) $\frac{s_D}{s_U}$ = ?

$$D = \frac{2}{6} \times \frac{8}{5} = \frac{16}{5} = 3.2 \text{ km}$$

$$D = 4 s_U = 6 s_D$$

$$D = 4\left(\frac{4}{3} - s_D\right) = 6 s_D$$

$$\frac{16}{3} - 4 s_D = 6 s_D$$

$$\frac{16}{3} = 10 s_D$$

$$s_D = \frac{8}{15}$$

Q. A man can row 9 km/hr in still water. It takes him twice as long as to row up as to row down. Find the rate of stream of the river.

$\frac{1(2^{10}-1)}{2-1} = 1023$

$\frac{S_U}{S_D} = \frac{2}{1}$

$\frac{S_U}{S_D} = \frac{1}{2}$

$\frac{9+S}{9-S} = \frac{2}{1}$

$9+S = 18-2S$

$3S = 9$

$S = 3$ km/hr

1, 3, 7

1, 1+2, 1+2+4

55

$1+2+4+8$

$\frac{B-S}{B+S} = \frac{1}{2}$

$\frac{B+S}{B-S} = \frac{2}{1}$

$\frac{B+S+B-S}{B+S-(B-S)} = \frac{2+1}{2-1}$

$\frac{B}{S} = \frac{3}{1}$

$S = 3$ km/hr

$K=1$

$2^{10}K - 1023x =$ 1023

$K = \frac{1023(x+1)}{1024}$

$= 1023$

8

1st $2K - x$

$2^{10}K = 1023(x+1)$

$1024K = 1023(x+1)$

2nd $2(2K-x) - x$

$4K - 3x$

3rd $2(4K-3x) - x$

$8K - 7x$

Amount rem $= 80\left(1-\frac{20}{100}\right)^2$

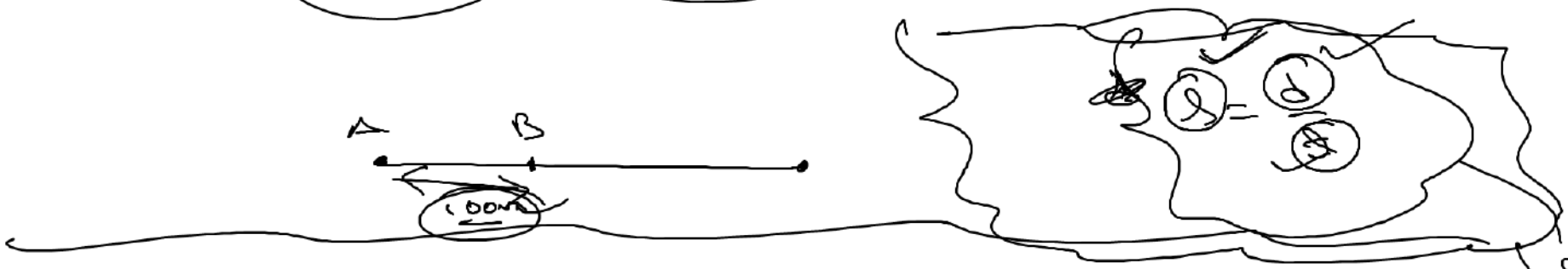
$= 80 \times \frac{4}{5} \times \frac{4}{5}$

$=$

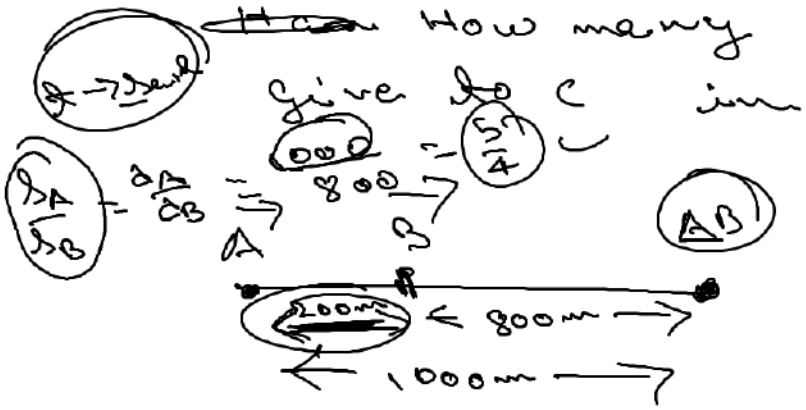
TSD

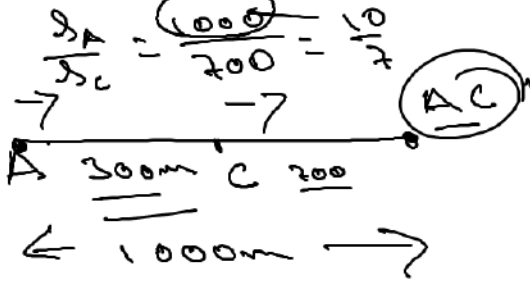
Races

Startup → headstart

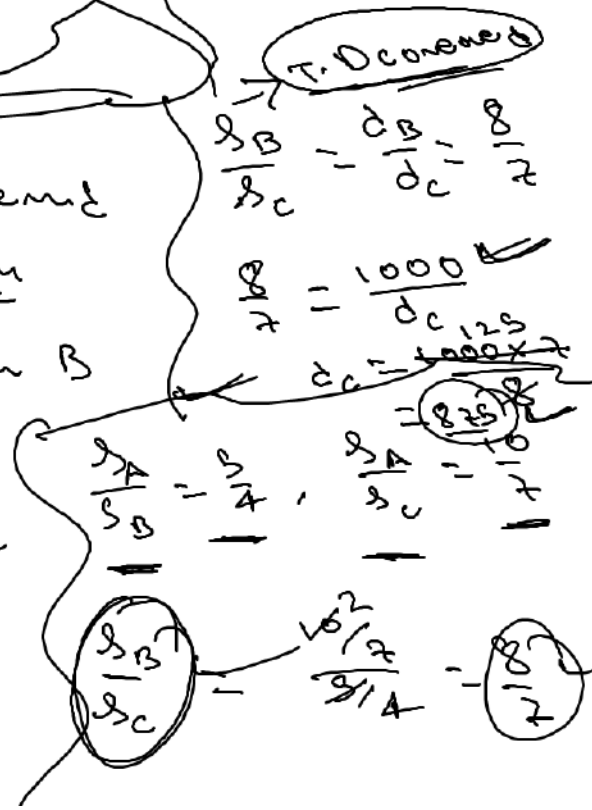


Q: A can give B a 200m startup and C 300m startup in a race of 1km. How many meters startup can B give to C in a 1 km race





T.D converted



Q. In a 1 km race A gives B a start of 100 m and in a 1 km race B gives a start of 80 m to C. In a 1 km race who will win and by how much distance from the second performer b/w two losers.

$$\frac{s_A}{s_B} = \frac{1000}{900} = \frac{10}{9}$$

$$\frac{s_A}{s_C} =$$

$$\frac{s_B}{s_C} = \frac{1000}{920} = \frac{25}{23}$$

$$\frac{s_A}{s_C} = \frac{10}{9} \times \frac{25}{23}$$

$$\frac{1000}{x} = \frac{250}{207} = \frac{250 \times 4}{207 \times 4}$$

$$x = 828$$

72 m

$$\frac{s_A}{s_C} = \frac{1000}{828}$$

Q.3.

$$\frac{s_A}{s_B} = \frac{4000}{3400} = \frac{20}{17}$$

$$\frac{s_B}{s_C} = \frac{4000}{3800} = \frac{20}{19}$$

$$\frac{s_A}{s_C} = \frac{400 \times 10}{323 \times 10}$$

4000 / 3230

230 m

Q. 5.

$$\frac{s_A}{s_B} = \frac{2500}{2000} = \frac{5}{4}$$

$$\frac{s_B}{s_C} = \frac{2000}{1200} = \frac{5}{3}$$

$$\frac{s_A}{s_C} = \frac{5}{4} \times \frac{5}{3} = \frac{25}{12}$$

$$\frac{d_A}{d_C} = \frac{25}{12} \Rightarrow \frac{3000}{d_C} = \frac{25}{12}$$

$$d_C = 1440$$

3000 − 1440 = 1560 m

1000 − 480 = 520 m

Q. 7.

$$\frac{3000}{50} = 60\,s = 1\,\text{min}$$

$$\frac{s_A}{s_C} = \frac{1000}{920} = \frac{25}{23}$$

$$\frac{s_B}{s_C} = \frac{1000}{900} = \frac{10}{9}$$

$$\frac{s_A}{s_C} = \frac{25}{23} \times \frac{10}{9} = \frac{250}{207} = \frac{1000}{828}$$

20 s, $d_C = 72$ m, 80 m

$$s_B = \frac{80}{20} = 4\,m/s$$

$$\frac{s_B}{s_C} = \frac{10}{9}, \quad \frac{4}{s_C} = \frac{10}{9}$$

$s_C = 3.6$

$$s_C = \frac{d_C}{t_C} = \frac{72}{3.6}$$

$d = 1.2$ km

$$\frac{s_A}{s_B} = \frac{2}{1}, \quad \frac{t_A}{t_B} = \frac{1}{2}$$

time taken by A

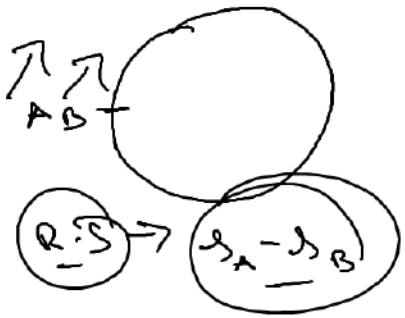
$$\frac{t}{t+20} = \frac{1}{2}$$

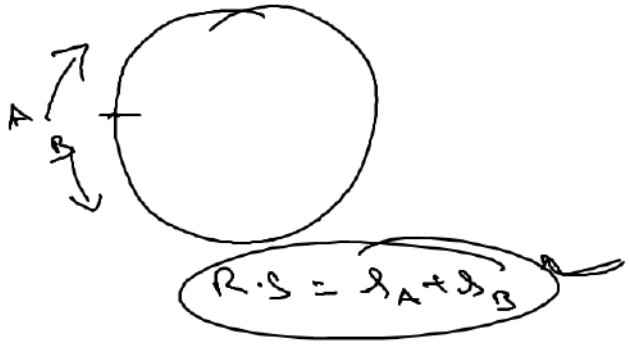
$2t = t + 20$, $t = 20$ s

1 km → 20 s

2.5 km → 2.5 × 20 = 50

* Circular Motion





2 Bodies (2-person)

→ 1st time meeting —

Time taken to meet = Length of track / R.S

→ 1st meeting at starting point —

Time taken = L.C.M (length of track / s_A , / s_B)

= L.C.M (s_A , s_B)

L.C.M (4, 12) = 12

20/12

Imp ⇒ L.C.M (a/b , c/d) = L.C.M(a, c) / H.C.F(b, d)

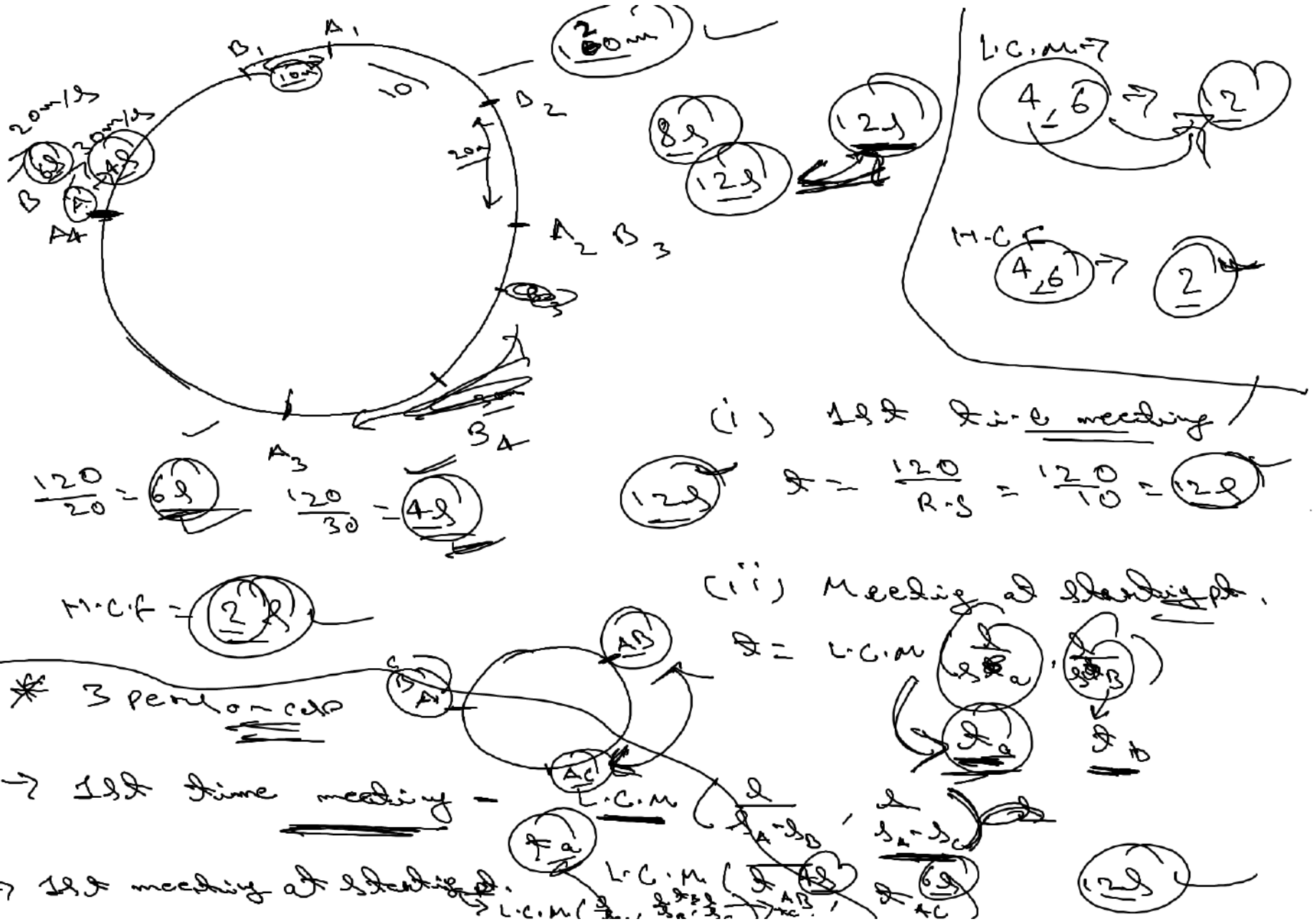
H.C.F (a/b , c/d) = H.C.F(a, c) / L.C.M(b, d)

L.C.M

4 | 4, 12

12 — 1, 3

4/1 = 4 — L.C.M (1/2 , 4/3)


A1
B1
B2
A2 B3
A3
B4
A4 B
20 m/s
30 m/s
10
20
L.C.M
4, 6
2
H.C.F
4, 6
2
(i) 1st time meeting
t = 120 / R.S = 120 / 10 = 12
(ii) Meeting at starting point.
t = L.C.M
* 3 persons
→ 1st time meeting -
→ 1st meeting at starting point.