GATE-2023 CRASH COURSE
Session- 14

GENERAL APTITUDE

RACES, TRAINS, BOATS & STREAMS

Lecture no- 14

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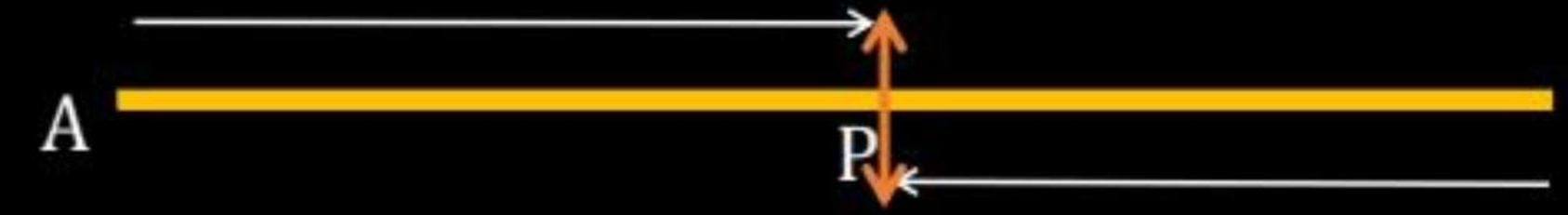
Two objects moving in opposite directions towards each other:

Distance covered by 1st object + Distance covered by 2nd object = Total distance



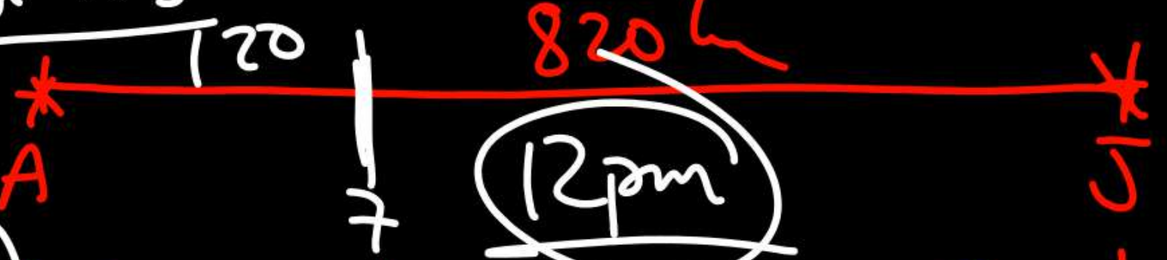
Two objects moving in same directions :

Distance covered by 1st object = Distance covered by 2nd object

Q. A train starts from Ahmedabad to Jabalpur at 5am everyday with the speed of 60kmph. Another train starts from Jabalpur to Ahmedabad at 7am everyday with the speed of 80 kmph. If the distance between Ahmedabad and Jabalpur is given as 820km, then at what time the two trains meet each other?

$D_1 + D_2 = T.D.$

After 5am → 'x' hrs



$D = 700\,km$

$R.S. = 140\,kmph$

$T = \frac{700}{140} = 5\,hrs$

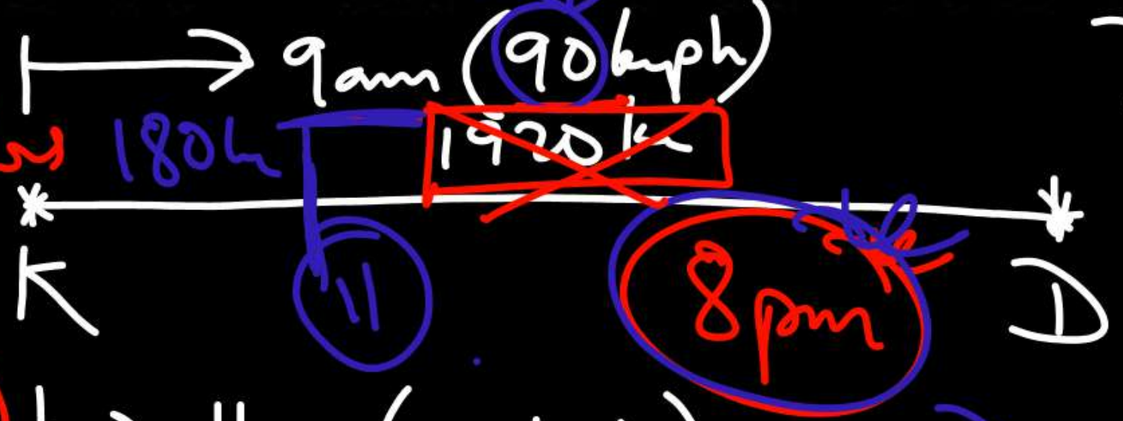
$820 = 60x + 80(x-2)$

$60x + 80x - 160 = 820$

$140x = 980$

$x = 7\,hrs$

Q. A train starts from Kolkata to Delhi at 11am with the speed of 110kmph. Another train starts from Kolkata to Delhi at 9am the same day with the speed of 90 kmph. If the distance between Kolkata and Delhi is given as 1920km, then at what time the two trains meet each other?



$D_1 = D_2$

After 9am → 'x' hrs

$90x = 110(x-2) \mapsto$ 11am (110kmph)

$90x = 110x - 220$

$20x = 220$ 11hrs

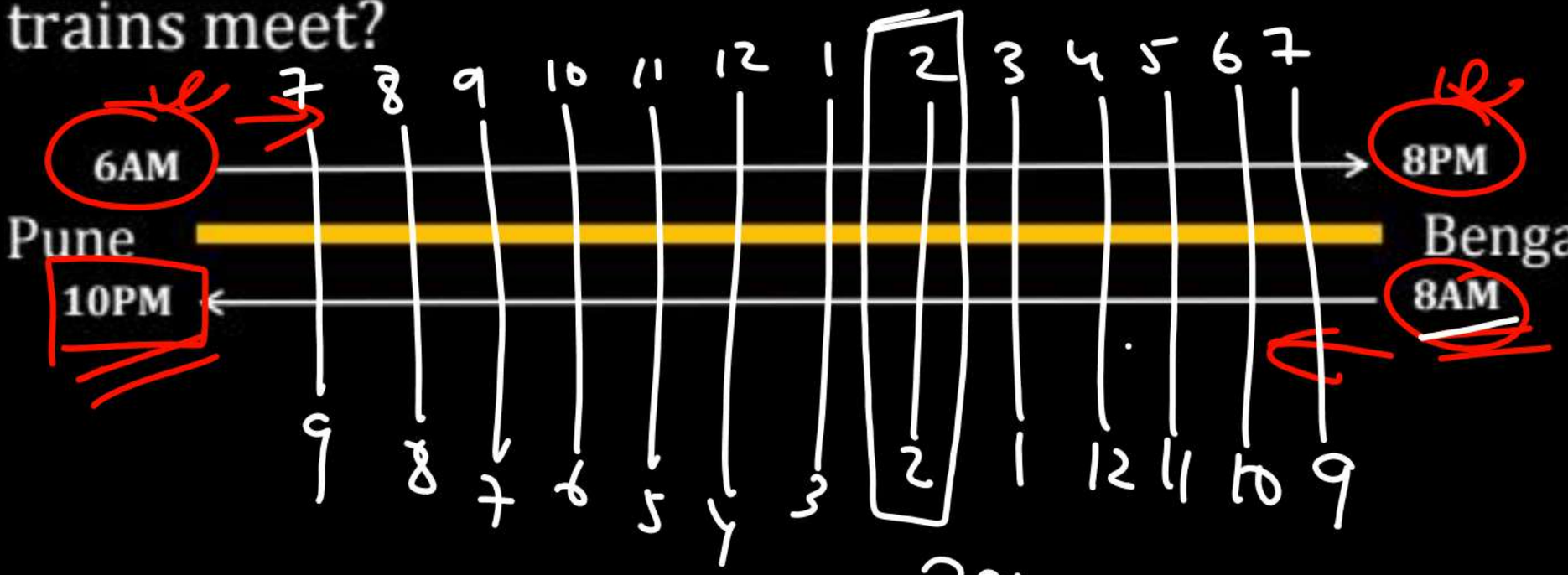
$D = 180$km

R.S. $= 20$kmph

$T = \frac{180}{20} = 9$hrs

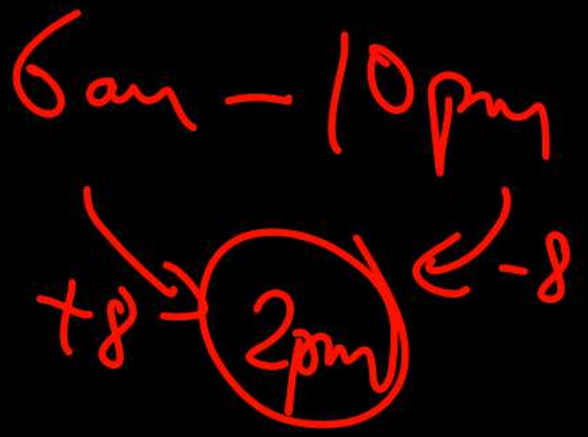
Q.

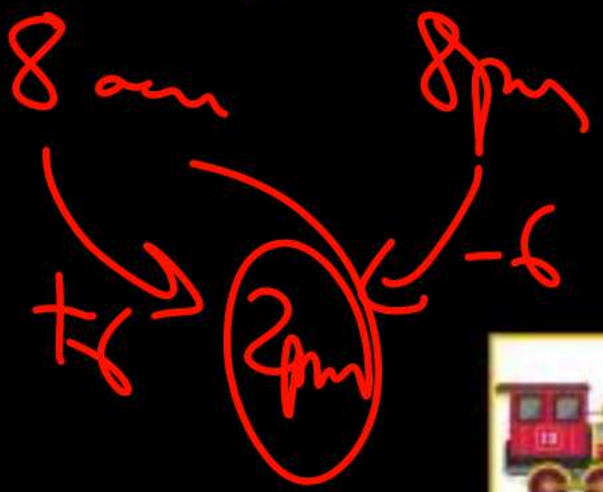
A train starts from Pune at 6am everyday and reaches Bengaluru 8pm the same day. Another train starts from Bengaluru at 8am everyday and reaches Pune at 10pm the same day. At what time these two trains meet?



2pm

Q. A train starts from Pune at 6am everyday and reaches Bengaluru 8pm the same day. Another train starts from Bengaluru at 8am everyday and reaches Pune at 10pm the same day. At what time these two trains meet?





Q. A train starts from Leh at 5am everyday and reaches Kanyakumari at 9am the same day. Another train starts from Kanyakumari at 8am everyday and reaches Leh at 2pm the same day. At what time these two trains meet?

$D_1 + D_2 = T.D.$

After 5am → 'y' hrs

$S_{T_1} = \frac{x}{4}$

$S_{T_2} = \frac{x}{6}$

$\frac{x}{4} y + \frac{x}{6}(y-3) = x$

$\frac{y}{4} + \frac{y-3}{6} = 1$

$$\frac{3}{\cancel{8}_{1}} \times \cancel{60}^{12} \quad \frac{y}{4} + \frac{y-3}{6} = 1$$

$$3y + 2y - 6 = 12$$

$$5y = 18$$

$$y = \frac{18}{5} = 3\frac{3}{5}\text{ hr}$$

5am
+ 3
8am

8:36am

Sol.

Train 1 = x/4 kmph Train 2 = x/6 kmph

Let's say that after 5am they meet in = y hrs

$(x/4) \times y + (x/6) \times (y-3) = x$

$y/4 + (y-3)/6 = 1$

$3y + 2y - 6 = 12$

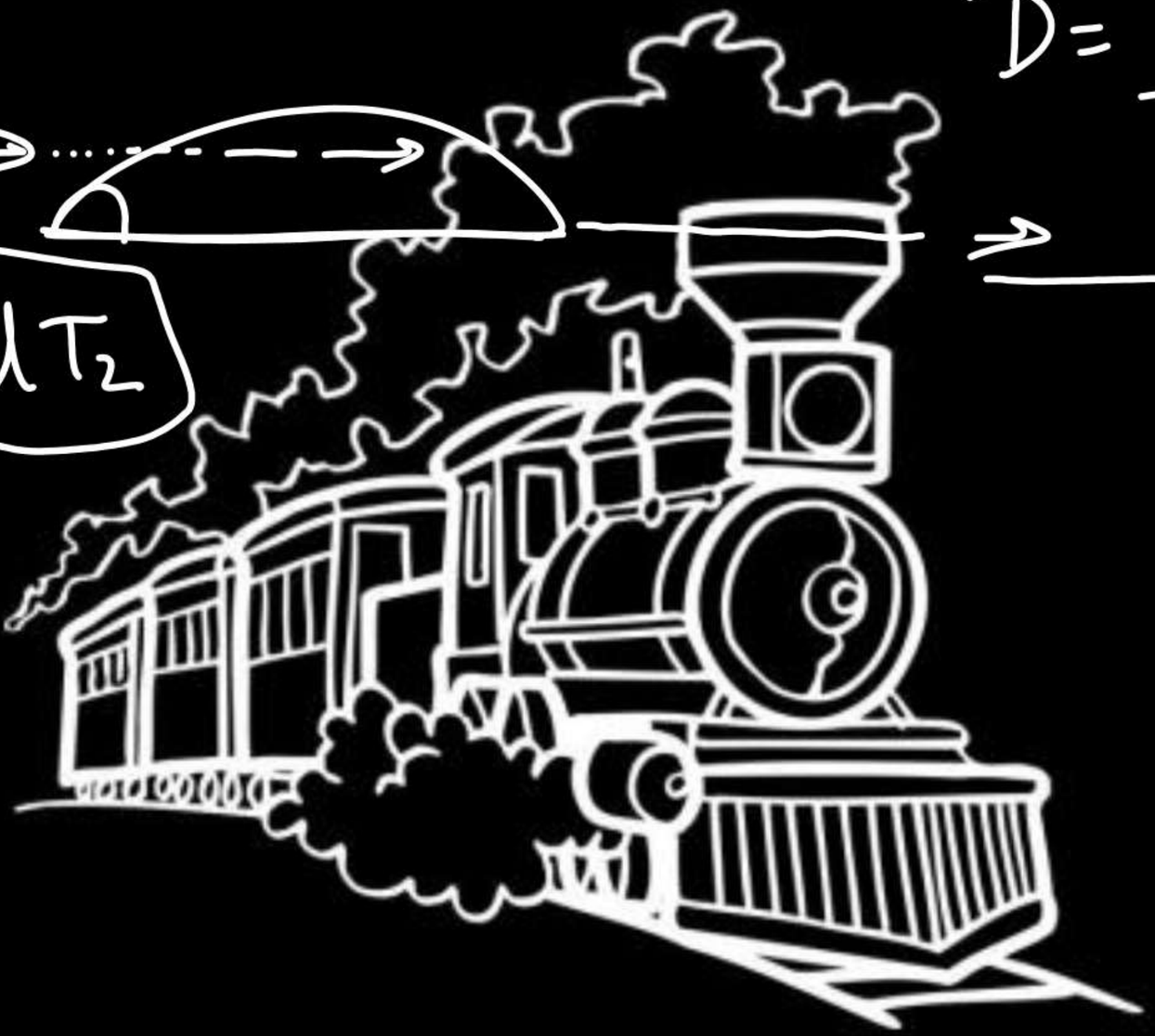
$y = 18/5$ hrs $= 3.6$hrs {3.6 hrs from 5am}

8 : 36 am

PROBLEMS ON TRAINS

$D = l_{T_1} + l_{T_2}$

$D = l$ of Train



PROBLEMS ON TRAINS

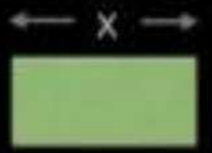
$D = l_{T_1} + l_{T_2}$

When a train try to cross a signal pole or standing man completely...
D = length of the train

R.S. = (2)

When a train try to cross a Platform or Bridge or Tunnel.....
D = length of the train + length of Platform or Bridge or Tunnel

R.S. = (+)



PROBLEMS ON TRAINS

PROBLEMS ON TRAINS

When a train try to cross another moving train.....

SAME DIRECTION : Speed (-)
OPPOSITE DIRECTION : Speed (+)

} Distance = Length of Train 1 + Length of Train 2

Q. If a train travelling at 40 km/hr crosses another train of length 100 meter travelling at 14 km/hr in opposite directions in 30 seconds, then find the length of the train.

$D = S \times T$

$D = l_{T_1} + l_{T_2} = l_{T_1} + 100$

$l_1 + 100 = 15 \times 30$

$l_{T_1} + 100 = 450$

$l_{T_1} = 350\text{m}$

R.S. $= 54\ \text{km/h} \times \frac{5}{18} = 15\ \text{m/sec}$

$T = 30\ \text{sec}$

Q. A train running at 52 km/hr takes 36 seconds to pass a platform. Next it takes 24 seconds to cross a man walking at the platform with 10 km/hr in the same direction. Find the length of the platform.

Train Cross Man

$D = l$ of Train.

$T = 24$ sec

$R.S. = 42$ km/hr

$l_T = 42 \times \frac{5}{18} \times 24$

$l_T = 280$ m

Train crossing Platform

$D = l_T + l_P = 280 + l_P$

$S = 52$ km/hr $\quad T = 36$ sec

$280 + l_P = 52 \times \frac{5}{18} \times 36$

$280 + l_P = 520$

$l_P = 240$ m

BOATS AND STREAMS

UPSTREAM SPEED (US)

DOWNSTREAM SPEED (DS)

BOATS AND STREAMS

UPSTREAM SPEED (US)

{Speed of Boat - Speed of water}

Speed of Boat = (DS+US) / 2

$\frac{D.S + U.S}{2}$

DOWNSTREAM SPEED (DS)

{Speed of Boat + Speed of Water}

Speed of Water = (DS-US) / 2

$\frac{D.S - U.S}{2}$

Q. A man rows his boat downstream @ 18 km/hr & upstream @ 10 km/hr. Find the speed of boat in still water.

$$S.B = \frac{D.S + U.S}{2}$$

$$S.B. = \frac{18+10}{2} = \frac{28}{2} = 14 \text{ km/hr}$$

Q. A boat traveled from A to B and back to A from B in 5 hours. If the speed of boat in still water and the speed of stream be 7.5 kmph and 1.5 kmph, then what is the distance between A and B?

$$\frac{x}{9} + \frac{x}{6} = 5$$

$$5x = 5 \times 18$$

$$x = 18 \text{ km}$$

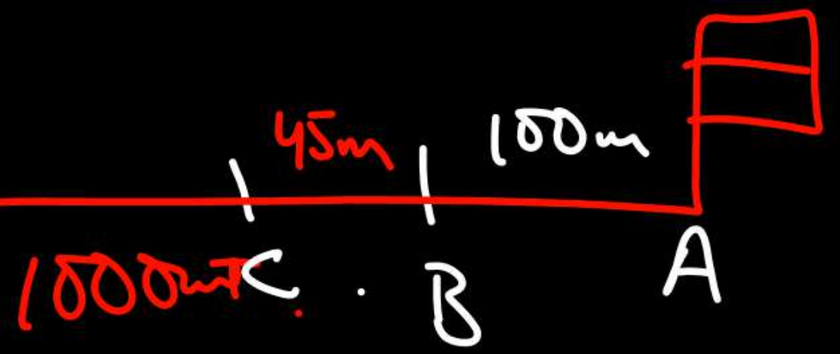
$$\frac{2x + 3x}{18} = 5$$

RACES

$\frac{A}{B} = \frac{1000}{900}$ $\frac{B}{C} = \frac{1000}{950}$

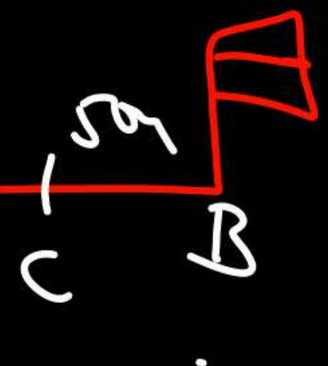
In a km race A defeats B by 100 meters and B defeats C by 50 meters, then A defeats C by how many meters?

$\frac{A}{B} \times \frac{B}{C} = \frac{1000}{900} \times \frac{1000}{950}$



$\frac{A}{C} = \frac{1000}{855}$

145m



RACES

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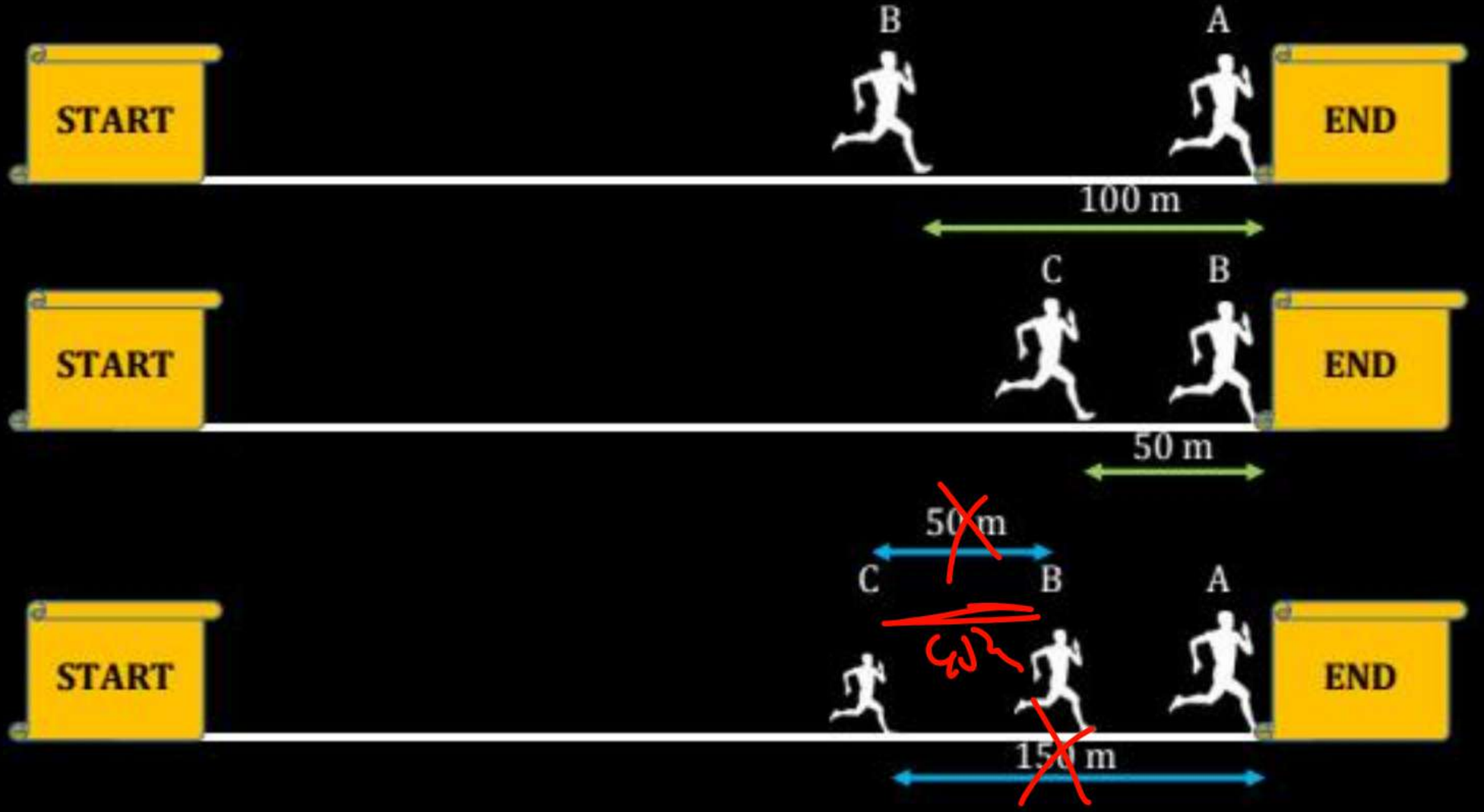

Q. In a km race A defeats B by 100 meters and B defeats C by 50 meters, then A defeats C by how many meters?

Q. In a km race A defeats (beats) B by 200 meters and B defeats C by 100 meters, then A defeats C by how many meters?

$\frac{A}{B} = \frac{1000}{800}$ $\frac{B}{C} = \frac{100}{90}$

$\frac{A}{C} = \frac{1000}{800} \times \frac{100}{900}$

$\frac{A}{C} = \frac{1000}{720}$

280m


thank you