



SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution



Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

VQAR-VERBAL QUANTITATIVE APTITUDE REASONING

IIYEAR/ III SEMESTER

1

UNIT 1-QUANTITATIVE ABILITY III

TOPIC 2: AVERAGE SPEED- RELATIVE SPEED- TRAIN PROBLEMS



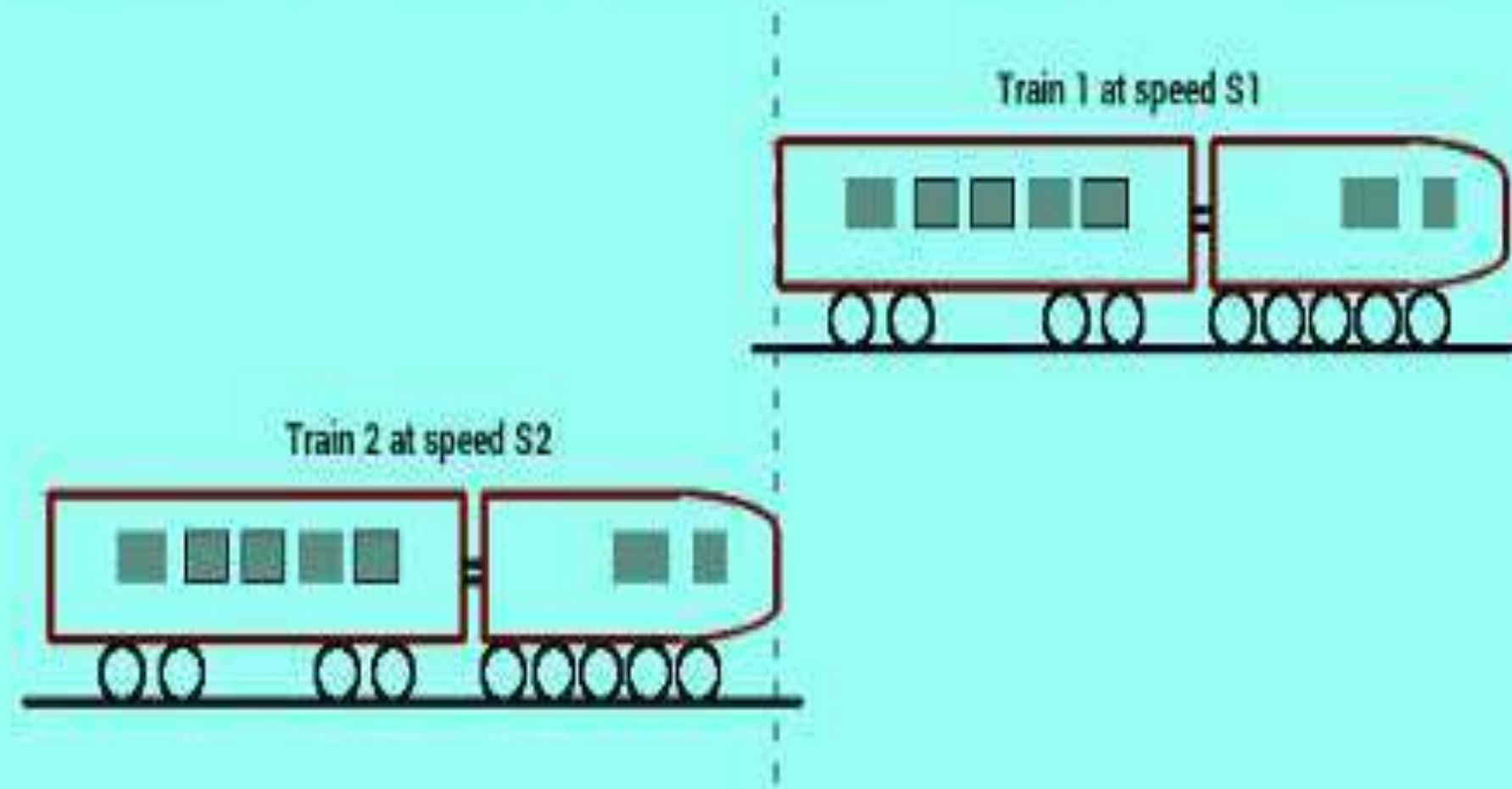
Time, Speed
and Distance

**Problems
on Trains**





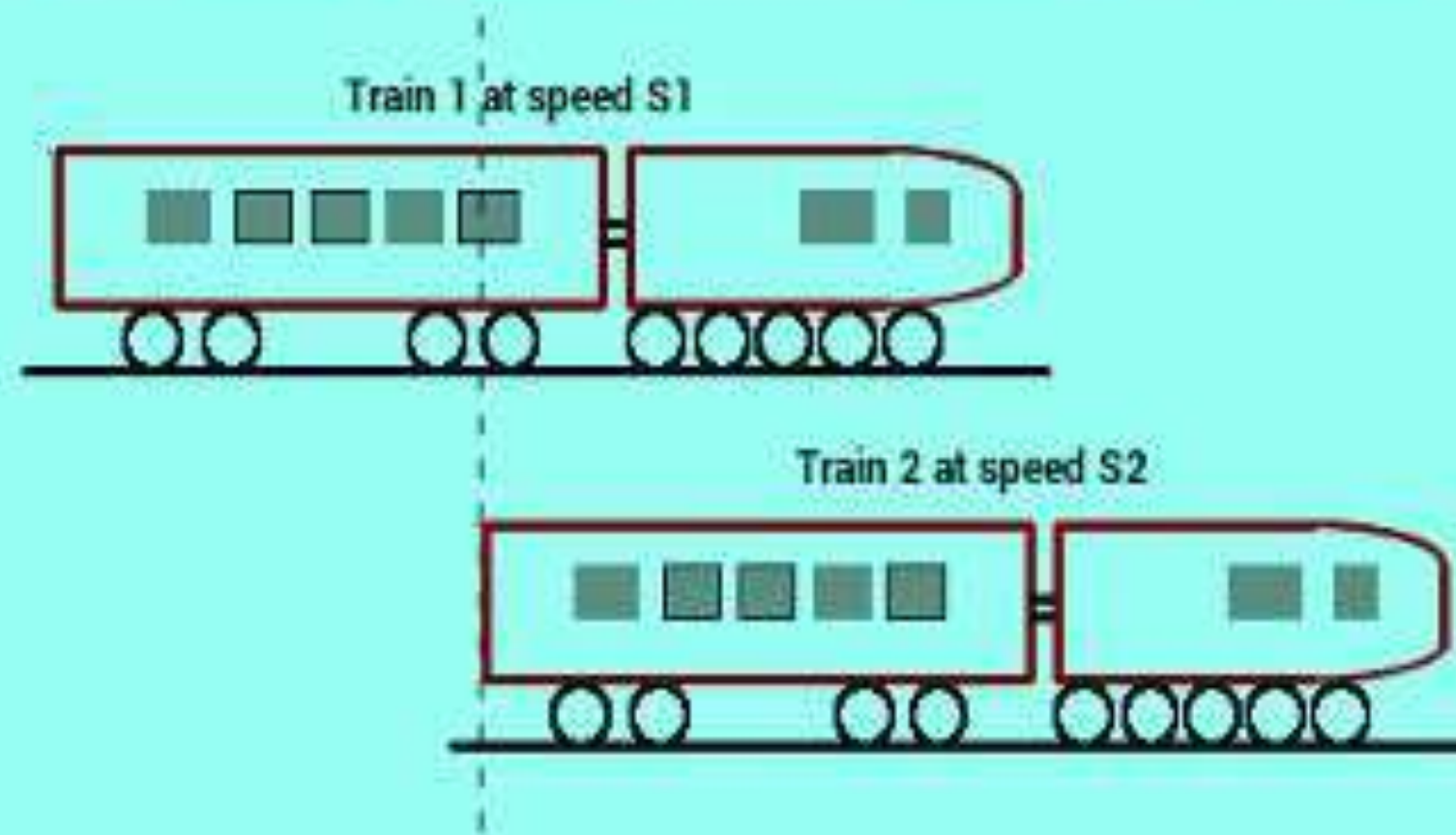
Train 1 travelling at speed S_1 passing Train 2 travelling at speed S_2 ($S_1 > S_2$)



Train 1 completely passed the Train 2 at relative speed $(S_1 - S_2)$



Train 1 travelling at speed S_1 passing Train 2 travelling at speed S_2 ($S_1 > S_2$)



Train 1 partially passed the Train 2 at relative speed $(S_1 - S_2)$



Q.1. A train crosses a tree in 20 seconds and a man cycling at 5 kmph in the opposite direction in 18 seconds. What is the length of the train?

Sol : Option A

Explanation: Let the speed of the train be x kmph and length of train = L Km.

$\therefore L = 18x$. Also, cycle is in opposite direction. \therefore Relative speed = $x + 5$

. So $18/(60 \times 60) = L/x + 5 \rightarrow x + 5 \rightarrow 200L = 180L + 5 \therefore L = 1/4 \text{ km}$



Q.2. A train travelling at 78 km/hr crosses a girl sitting in a train of length 110 m travelling in the same direction at 42 km/hr in 20 seconds. The length of the faster train is

Sol : Option C

Explanation: Let the length of the faster train = x

$$\therefore 18x/[5(78-42)] = 20 \rightarrow x=200$$

$\rightarrow 200\text{m}$



Q.3. Two trains are traveling in opposite directions at 90 kmph and 18 kmph. If the length of the faster train is 600 m, find the time taken by the faster train to cross a man standing in the slower train.

Sol : Option A

Explanation: As the faster train crosses the man in the slower train, time taken in this case = length of the faster train / Relative speed.

Thus time = $600 / 30 = 20$ seconds.



Q.4. A train moving with a speed of 40 km/hr takes 2 hours 6 minutes more to cover a certain distance than a train moving at 96 km/hr. What is the distance?

Sol : Option A

Explanation: Let the distance be x $\therefore \frac{x}{40} - \frac{x}{96} = 2\frac{6}{60} \rightarrow \frac{x}{40} - \frac{x}{96} = \frac{21}{10} \therefore x = 144$ km.



5. Two trains of lengths 120 m and 50 m are running on parallel tracks at 66 km/hr and 60 km/hr respectively. In what time will they pass each other?

Sol : Option D

Explanation: Dist to be covered is $120 + 50 = 170$ m.

Relative speed is $66 - 60 = 5$ km/hr = $6 \times 5 / 18$

= $30 / 18$ m/s. So time required = $170 / (30 / 18) = 102$ sec.



Q.6. The distance between two stations, Delhi and Amritsar, is 530 km. A train starts at 4 p.m. from Delhi and moves to Amritsar at an average speed of 80 km/hr. Another train starts from Amritsar at 3.20 p.m. and moves towards Delhi at an average speed of 60 km/hr. How far from Delhi will the two meet?

Sol : Option B

Explanation: Suppose the trains meet at a distance of x km from Delhi.

At 4 pm the distance that has to be covered is

$$530 - 60 \times \frac{2}{3} = 490 \text{ km.}$$

The relative speed of the trains is $80 + 60 = 140$ km/h. Time required for covering the distance is

$$490 / 140 \text{ hours.}$$

The train from Delhi will be $80 \times 49 / 14$ km away from Delhi at the point of meeting. $= 40 \times 49 / 7 = 280$ km.



Q7. A train passes a station platform in 36 sec and a man standing on the platform in 20 sec. If the speed of the train is 54 km/hr, find the length of the platform.

Sol : Option A

Explanation: Speed of the train is $54 \times \frac{5}{18} = 15$ m/s.

Length of the train is $20 \times 15 = 300$ m.

Length of platform + train = $36 \times 15 = 540$ m.

So the length of the platform is $540 - 300 = 240$ m.

(No wonder it did not stop at this station!)



Q8. Two trains of lengths 110 m and 90 m are running on parallel tracks at 45 km/hr and 50 km/hr respectively. In what time will they pass each other?

Sol : Option D

Explanation: Distance to be covered is $110 + 90 = 200$ m. Relative speed is $50 - 45 = 5$ km/hr = $5 \times \frac{5}{18} = \frac{25}{18}$ m/s. So time required = $200 / (\frac{25}{18}) = 144$ sec.



Q9. A train running at 54 km/hr crosses a telegraph pole in 18 seconds less time than it takes to cross a platform. Find the length of the platform.

Sol : Option C

Explanation: : Speed is $54 \times \frac{5}{18} = 15$ m/s. Let the time required for crossing the pole be t . Length of the train is $15 \times t$. Length of the train + length of the platform = $15 \times (t + 18)$. So length of the platform = $15 \times (t + 18) - 15 \times t = 15 \times 18 = 270$ m.



Q10. A train crosses a platform at 54 km/hr in 20 seconds. Another train is 150 m shorter than the former and is running at 36 km/hr. Find the time the second train will take to cross the same platform.

Sol : Option C

Explanation: Speed of the first train is $54 \times \frac{5}{18} = 15$ m/s.

(Length of the platform + length of the train) is $= 20 \times 15$

$= 300$ m. If the second train is 150 m shorter, then the length of the platform + length of the second train is $300 - 150 = 150$ m.

That train is running at 36 km/hr $= 36 \times \frac{5}{18} = 10$ m/s.

So it will take $150 / 10 = 15$ seconds to cross the platform.



Formulas and Quick Tricks for Train Problems



1. Time taken by a train x metres long in passing a signal post or a pole or a standing man is equal to the time taken by the train to cover x metres.
2. Time taken by a train x metres long in passing a stationary object of length y metres is equal to the time taken by the train to cover $x+y$ metres.
3. Suppose two trains are moving in the same direction at u kmph and v kmph such that $u > v$, then their relative speed = $u-v$ kmph.
4. If two trains of length x km and y km are moving in the same direction at u kmph and v kmph, where $u > v$, then time taken by the faster train to cross the slower train = $(x+y)/(u-v)$ hours.
5. Suppose two trains are moving in opposite directions at u kmph and v kmph. Then, their relative speed = $(u+v)$ kmph.
6. If two trains of length x km and y km are moving in the opposite directions at u kmph and v kmph, then time taken by the trains to cross each other = $(x+y)/(u+v)$ hours.
7. If two trains start at the same time from two points A and B towards each other and after crossing they take a and b hours in reaching B and A respectively, then A's speed : B's speed = $(\sqrt{b} : \sqrt{a})$

