



SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore-35



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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

19GET276 – VQAR II

II YEAR/ IV SEMESTER

UNIT 1 – QUANTITATIVE ABILITY III

TOPIC – AVERAGE SPEED, RELATIVE SPEED, TRAINS



TRAINS



- Time taken by a train of length l metres to pass a pole or standing man or a signal post is equal to the time taken by the train to cover l metres.
- Time taken by a train of length l metres to pass a stationery object of length b metres is the time taken by the train to cover $(l + b)$ metres.
- Suppose two trains or two objects bodies are moving in the same direction at u m/s and v m/s, where $u > v$, then their relative speed is $= (u - v)$ m/s.
- Suppose two trains or two objects bodies are moving in opposite directions at u m/s and v m/s, then their relative speed is $= (u + v)$ m/s.
- If two trains of length a metres and b metres are moving in opposite directions at u m/s and v m/s, then:
The time taken by the trains to cross each other $= \frac{(a + b)}{(u + v)}$ sec.
- If two trains of length a metres and b metres are moving in the same direction at u m/s and v m/s, then:
The time taken by the faster train to cross the slower train $= \frac{(a + b)}{(u - v)}$ sec.

TRAINS

1. A train running at the speed of 60 km/hr crosses a pole in 9 seconds. What is the length of the train?

- A. 120 metres
- B. 180 metres
- C. 324 metres
- D. 150 metres

Answer: Option D

Explanation:

$$\text{Speed} = \left(60 \times \frac{5}{18} \right) \text{m/sec} = \left(\frac{50}{3} \right) \text{m/sec.}$$

Length of the train = (Speed x Time).

$$\therefore \text{Length of the train} = \left(\frac{50}{3} \times 9 \right) \text{m} = 150 \text{ m.}$$

TRAINS

2. 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:

- A. 45 km/hr
- B. 50 km/hr
- C. 54 km/hr
- D. 55 km/hr

Answer: Option B

Explanation:

$$\text{Speed of the train relative to man} = \left(\frac{125}{10} \right) \text{m/sec}$$

$$= \left(\frac{25}{2} \right) \text{m/sec.}$$

$$= \left(\frac{25}{2} \times \frac{18}{5} \right) \text{km/hr}$$

$$= 45 \text{ km/hr.}$$

Let the speed of the train be x km/hr. Then, relative speed = $(x - 5)$ km/hr.

$$\therefore x - 5 = 45 \Rightarrow x = 50 \text{ km/hr.}$$

TRAINS

3. The length of the bridge, which a train 130 metres long and travelling at 45 km/hr can cross in 30 seconds, is:

- A. 200 m
- B. 225 m
- C. 245 m
- D. 250 m

Answer: Option C

Explanation:

$$\text{Speed} = \left(45 \times \frac{5}{18} \right) \text{m/sec} = \left(\frac{25}{2} \right) \text{m/sec.}$$

Time = 30 sec.

Let the length of bridge be x metres.

$$\text{Then, } \frac{130 + x}{30} = \frac{25}{2}$$

$$\Rightarrow 2(130 + x) = 750$$

$$\Rightarrow x = 245 \text{ m.}$$

TRAINS

4. Two trains running in opposite directions cross a man standing on the platform in 27 seconds and 17 seconds respectively and they cross each other in 23 seconds. The ratio of their speeds is:

- A. 1 : 3
- B. 3 : 2
- C. 3 : 4
- D. None of these

Answer: Option **B**

Explanation:

Let the speeds of the two trains be x m/sec and y m/sec respectively.

Then, length of the first train = $27x$ metres,

and length of the second train = $17y$ metres.

$$\therefore \frac{27x + 17y}{x + y} = 23$$

$$\Rightarrow 27x + 17y = 23x + 23y$$

$$\Rightarrow 4x = 6y$$

$$\Rightarrow \frac{x}{y} = \frac{3}{2}$$

TRAINS

5. A train passes a station platform in 36 seconds and a man standing on the platform in 20 seconds. If the speed of the train is 54 km/hr, what is the length of the platform?

- A. 120 m
- B. 240 m
- C. 300 m
- D. None of these

Answer: Option B

Explanation:

$$\text{Speed} = \left(54 \times \frac{5}{18} \right) \text{m/sec} = 15 \text{ m/sec.}$$

$$\text{Length of the train} = (15 \times 20) \text{m} = 300 \text{ m.}$$

Let the length of the platform be x metres.

$$\text{Then, } \frac{x + 300}{36} = 15$$

$$\Rightarrow x + 300 = 540$$

$$\Rightarrow x = 240 \text{ m.}$$



TRAINS

6. A train 240 m long passes a pole in 24 seconds. How long will it take to pass a platform 650 m long?

- A. 65 sec
- B. 89 sec
- C. 100 sec
- D. 150 sec

Answer: Option **B**

Explanation:

$$\text{Speed} = \left(\frac{240}{24} \right) \text{m/sec} = 10 \text{ m/sec.}$$

$$\therefore \text{Required time} = \left(\frac{240 + 650}{10} \right) \text{sec} = 89 \text{ sec.}$$

TRAINS

7. Two trains of equal length are running on parallel lines in the same direction at 46 km/hr and 36 km/hr. The faster train passes the slower train in 36 seconds. The length of each train is:

- A. 50 m
- B. 72 m
- C. 80 m
- D. 82 m

Answer: Option A

Explanation:

Let the length of each train be x metres.

Then, distance covered = $2x$ metres.

Relative speed = $(46 - 36)$ km/hr

$$= \left(10 \times \frac{5}{18} \right) \text{m/sec}$$

$$= \left(\frac{25}{9} \right) \text{m/sec}$$

$$\therefore \frac{2x}{36} = \frac{25}{9}$$

$$\Rightarrow 2x = 100$$

$$\Rightarrow x = 50.$$



TRAINS

8. A train 360 m long is running at a speed of 45 km/hr. In what time will it pass a bridge 140 m long?

- A. 40 sec
- B. 42 sec
- C. 45 sec
- D. 48 sec

Answer: Option A

Explanation:

Formula for converting from km/hr to m/s: $X \text{ km/hr} = \left(X \times \frac{5}{18} \right) \text{ m/s.}$

Therefore, Speed = $\left(45 \times \frac{5}{18} \right) \text{ m/sec} = \frac{25}{2} \text{ m/sec.}$

Total distance to be covered = $(360 + 140) \text{ m} = 500 \text{ m.}$

Formula for finding Time = $\left(\frac{\text{Distance}}{\text{Speed}} \right)$

\therefore Required time = $\left(\frac{500 \times 2}{25} \right) \text{ sec} = 40 \text{ sec.}$

TRAINS

9. Two trains are moving in opposite directions @ 60 km/hr and 90 km/hr. Their lengths are 1.10 km and 0.9 km respectively. The time taken by the slower train to cross the faster train in seconds is:

- A. 36
- B. 45
- C. 48
- D. 49

Answer: Option C

Explanation:

Relative speed = $(60 + 90)$ km/hr

$$= \left(150 \times \frac{5}{18} \right) \text{m/sec}$$

$$= \left(\frac{125}{3} \right) \text{m/sec.}$$

Distance covered = $(1.10 + 0.9)$ km = 2 km = 2000 m.

$$\text{Required time} = \left(2000 \times \frac{3}{125} \right) \text{sec} = 48 \text{ sec.}$$

TRAINS

10. A jogger running at 9 kmph alongside a railway track in 240 metres ahead of the engine of a 120 metres long train running at 45 kmph in the same direction. In how much time will the train pass the jogger?

- A. 3.6 sec
- B. 18 sec
- C. 36 sec
- D. 72 sec

Answer: Option C

Explanation:

Speed of train relative to jogger = $(45 - 9)$ km/hr = 36 km/hr.

$$= \left(36 \times \frac{5}{18} \right) \text{ m/sec}$$
$$= 10 \text{ m/sec.}$$

Distance to be covered = $(240 + 120)$ m = 360 m.

$$\therefore \text{Time taken} = \left(\frac{360}{10} \right) \text{ sec} = 36 \text{ sec.}$$

TRAINS

11. A 270 metres long train running at the speed of 120 kmph crosses another train running in opposite direction at the speed of 80 kmph in 9 seconds. What is the length of the other train?

- A. 230 m
- B. 240 m
- C. 260 m
- D. 320 m
- E. None of these

Answer: Option A

Explanation:

Relative speed = $(120 + 80)$ km/hr

$$= \left(200 \times \frac{5}{18} \right) \text{m/sec}$$

$$= \left(\frac{500}{9} \right) \text{m/sec.}$$

Let the length of the other train be x metres.

$$\text{Then, } \frac{x + 270}{9} = \frac{500}{9}$$

$$\Rightarrow x + 270 = 500$$

$$\Rightarrow x = 230.$$



TRAINS



12. A goods train runs at the speed of 72 kmph and crosses a 250 m long platform in 26 seconds. What is the length of the goods train?

- A. 230 m
- B. 240 m
- C. 260 m
- D. 270 m

Answer: Option **D**

Explanation:

$$\text{Speed} = \left(72 \times \frac{5}{18} \right) \text{m/sec} = 20 \text{ m/sec.}$$

Time = 26 sec.

Let the length of the train be x metres.

$$\text{Then, } \frac{x + 250}{26} = 20$$

$$\Rightarrow x + 250 = 520$$

$$\Rightarrow x = 270.$$



TRAINS

13. Two trains, each 100 m long, moving in opposite directions, cross each other in 8 seconds. If one is moving twice as fast the other, then the speed of the faster train is:

- A. 30 km/hr
- B. 45 km/hr
- C. 60 km/hr
- D. 75 km/hr

Answer: Option C

Explanation:

Let the speed of the slower train be x m/sec.

Then, speed of the faster train = $2x$ m/sec.

Relative speed = $(x + 2x)$ m/sec = $3x$ m/sec.

$$\therefore \frac{(100 + 100)}{8} = 3x$$

$$\Rightarrow 24x = 200$$

$$\Rightarrow x = \frac{25}{3}$$

$$\text{So, speed of the faster train} = \frac{50}{3} \text{ m/sec}$$

$$= \left(\frac{50}{3} \times \frac{18}{5} \right) \text{ km/hr}$$

$$= 60 \text{ km/hr.}$$

TRAINS

14. Two trains 140 m and 160 m long run at the speed of 60 km/hr and 40 km/hr respectively in opposite directions on parallel tracks. The time (in seconds) which they take to cross each other, is:

- A. 9
- B. 9.6
- C. 10
- D. 10.8

Answer: Option D

Explanation:

$$\text{Relative speed} = (60 + 40) \text{ km/hr} = \left(100 \times \frac{5}{18}\right) \text{ m/sec} = \left(\frac{250}{9}\right) \text{ m/sec.}$$

$$\text{Distance covered in crossing each other} = (140 + 160) \text{ m} = 300 \text{ m.}$$

$$\text{Required time} = \left(300 \times \frac{9}{250}\right) \text{ sec} = \frac{54}{5} \text{ sec} = 10.8 \text{ sec.}$$

TRAINS

15. A train 110 metres long is running with a speed of 60 kmph. In what time will it pass a man who is running at 6 kmph in the direction opposite to that in which the train is going?

- A. 5 sec
- B. 6 sec
- C. 7 sec
- D. 10 sec

Answer: Option B

Explanation:

Speed of train relative to man = $(60 + 6)$ km/hr = 66 km/hr.

$$= \left(66 \times \frac{5}{18} \right) \text{m/sec}$$

$$= \left(\frac{55}{3} \right) \text{m/sec.}$$

$$\therefore \text{Time taken to pass the man} = \left(110 \times \frac{3}{55} \right) \text{sec} = 6 \text{ sec.}$$



THANK YOU

