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 ELECTRONICS & COMMUNICATION 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:

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

Length of the train = (Speed x Time).

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

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

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

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

= 45 km/hr.

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

$\therefore$ $x - 5 = 45 \Rightarrow x = 50$ 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:

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

Time = 30 sec.

Let the length of bridge be x metres.

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

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

$\Rightarrow x = 245$ 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.

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

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

$$\Rightarrow 4x = 6y$$

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

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:

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

Length of the train = (15 x 20)m = 300 m.

Let the length of the platform be x metres.

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

$\Rightarrow x + 300 = 540$

$\Rightarrow x = 240$ 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

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

$= \left(\frac{25}{9}\right)$ 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 km/hr $= \left(X \times \frac{5}{18}\right)$ m/s.

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

Total distance to be covered = (360 + 140) m = 500 m.

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

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

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

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

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

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

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

= 10 m/sec.

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

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

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

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

Let the length of the other train be x metres.

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:

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

Time = 26 sec.

Let the length of the train be x metres.

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.

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

$\Rightarrow 24x = 200$

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

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

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

$= 60$ 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:

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

Distance covered in crossing each other = (140 + 160) m = 300 m.

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

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

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

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

THANK YOU