# 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

## 23GET276 – 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