CSAT PAPER

ARITHMETIC APTITUDE TEST

Trains:

Important formulas :

1. km/hr to m/s conversion:

$$a \text{ km/hr} = \left(a \times \frac{5}{18}\right) \text{m/s}.$$

2. m/s to km/hr conversion:

$$a \text{ m/s} = \left(a \times \frac{18}{5}\right) \text{ km/hr.}$$

3. Formulas for finding Speed, Time and Distance

- 4. Time taken by a train of length / metres to pass a pole or standing man or a signal post is equal to the time taken by the train to cover / metres.
- 5. 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 um/s and v m/s, where u > v, then their relative speed is = (u v) m/s.
- 7. Suppose two trains or two objects bodies are moving in opposite directions at um/s and v m/s, then their relative speed is = (u + v) m/s.
- 8. 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.

9. 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.

10.If two trains (or bodies) start at the same time from points A and B towards each other and after crossing they take *a* and *b* sec in reaching B and A respectively, then:

(A's speed) : (B's speed) = (b : a)

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

Α.	120 metres	В.	180 metres	

C. 324 metres **D.** 150 metres

Answer & Explanation

Answer: Option D

Explanation:

- Speed= $\left(\int 60 \times \frac{5}{18} \right)_{m/sec} = \left(\int \frac{50}{3} \right)_{m/sec}$. Length of the train = (Speed x Time) = $\left(\int \frac{50}{3} \times 9 \right)_{m} = 150 \text{ m}.$
- 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 & Explanation

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.

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

Α.	200 m		В.	225 m

C. 245 m **D.** 250 m

Answer & Explanation

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

 $\Rightarrow 12(130 + x) = 750$
 $\Rightarrow 1x = 245$ m.

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 & Explanation

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.

$$\therefore | \frac{27x + 17y}{x + y} = 23$$
$$\Rightarrow | 27x + 17y = 23x + 23y$$
$$\Rightarrow | 4x = 6y$$
$$\Rightarrow | \frac{x}{y} = \frac{3}{2}.$$

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?

Α.	120 m	В.	240 m
C.	300 m	D.	None of these

Answer & Explanation

Answer: Option B

Explanation:

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

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

Let the length of the platform be *x* metres.

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

 $\Rightarrow x + 300 = 540$
 $\Rightarrow x = 240 \text{ m.}$

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

Α.	65 sec		В.	89 sec

C. 100 sec **D.** 150 sec

Answer & Explanation

Answer: Option B

Explanation:

Speed = $\left(\frac{240}{24}\right)_{m/sec} = 10 \text{ m/sec.}$ \therefore | Required time = $\left(\frac{240 + 650}{10}\right)_{sec} = 89 \text{ sec.}$

 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

```
<u>www.kushmanda.com</u>
```

C. 80 m D. 82	2 m
-----------------------------	-----

Answer & Explanation

Answer: Option A

Explanation:

Let the length of each train be *x* metres.

Then, distance covered = 2x metres.

Relative speed = (46 - 36) km/hr

$$= \left(\left| 10 \times \frac{5}{18} \right| \right)_{m/sec}$$
$$= \left(\left| \frac{25}{9} \right| \right)_{m/sec}$$
$$\therefore \left| \frac{2x}{36} \right| = \frac{25}{9}$$
$$\Rightarrow 2x = 100$$
$$\Rightarrow x = 50.$$

- 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 & Explanation

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 = $\left[45 \times \frac{5}{2}\right] = 25 \text{ m/sec.}$

2

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

18

Formula for finding Time = $\left(\frac{\text{Distance}}{\text{Speed}}\right)$ \therefore |Required time = $\left(\frac{500 \times 2}{25}\right)_{\text{sec}}$ = 40 sec.

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 & Explanation

Answer: Option C

Explanation:

Relative speed = (60+ 90) km/hr

$$= \left(\left| 150 \times \frac{5}{18} \right| \right)_{m/sec}$$
$$= \left(\left| \frac{125}{3} \right| \right)_{m/sec.}$$

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

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

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

www.kushmanda.com

C. 36 sec **D.** 72 sec

Answer & Explanation

Answer: Option C

Explanation:

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

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

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

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