TIME, DISTANCE AND SPEED

SPEED

Speed is a basic concept in motion. It is about moving of object and how fast or slow it moves.
Speed can be defined as the amount of **Distance covered in a given Time period**.

Formula of Distance:-

Distance = Speed × Time

Speed = $\frac{Distance}{time}$

Time = $\frac{Distance}{speed}$

Note: - Distance is directly proportional to Velocity when time is constant.

Ex. A person goes at a speed of 60 km/h and travel for 2 hours. What is the distance covered by him?

Sol: Speed = 60
Time = 2
Distance = Speed × time
Distance = 60 × 2 = 120 km

Conversion of speed

1. **Convert from kph (km/h) to mps(m/sec)**

For converting kph to mps, following formula is used.

Speed in km/h × $\frac{5}{18}$ = Speed in m/sec

2. **Convert from mps (m/sec) to kph(km/h)**

For converting m/sec to km/h, the following formula is used.

Speed in m/sec × $\frac{18}{5}$ = Speed in km/h

If the ratio of the speeds of A and B is 1:2, then the ratio of the times taken by them to cover the same distance is 2: 1

Note: - Time is inversely proportional to speed when Distance is constant.

Average speed

Average speed = $\frac{Total\ \ distance}{Total\ \ time}$

Suppose a man covers a certain distance at x km/hr and an equal distance at y km/hr. Then, the average speed during the whole journey is :- $\frac{2xy}{(x+y)}$

Ex. A man travels half of his journey at 60 km/h and remaining at 40 km/h. Find the average speed of the journey.

Sol: Average speed = $\frac{2xy}{(x+y)}$

Average speed = $\frac{2\times60\times40}{60+40}$ = 48 km/h

Relative Speed

(1) If two objects are moving in same direction with speeds X and Y, then the relative speed is X–Y.

Ex. Two persons are moving in the same direction at 5km/h and 7 km/h. Total distance between them is 12 km. Find the time when they meet.
Sol: Distance = 12 km
Relative speed = (7–5) = 2 km/h

Time = $\frac{Distance}{speed}$

Time = $\frac{12}{2}$ = 6 hours

(2) If two objects are moving is opposite direction with speeds X and Y, then their relative speed is X+Y.

Ex. Two persons are moving in the opposite direction at 5km/h and 7 km/h. Total distance between them is 12 km. Find the time when they meet.
Sol: Distance = 12 km
Relative speed = (7+5) = 12 km/h

Time = $\frac{Distance}{speed}$

Time = $\frac{12}{12}$ = 1 hour

Important Questions for Practice

1. Ravi takes 40 minutes to cover a distance. He covers $\frac{3}{5}$th of the distance at a speed of 9 km/h and remaining distance at a speed of 6 km/h. What is the total distance covered by Ravi?
(A) 4 Km (B) 4.5 Km
(C) 5 Km (D) 5.5 Km
(E) None of these

2. Deepak travels $\frac{1}{4}$ of the distance on a straight road with at a speed of 45 km/h, the next $\frac{1}{3}$ at the rate of 30 km/h and the remaining at the speed of 25 km/h. What is the Average speed of the whole journey travelled by Deepak?
(A) 30 Km/h (B) 35 Km/h
(C) 40 Km/h (D) 45 Km/h
(E) 50 Km/h

3. There is a track near to the house of Ramesh with a radius of 350 meters. Ramesh starts jogging on the track and after 33 min he reaches on just opposite side of his initial point on track. What is the average speed of the Ramesh?
(A) 3 Km/h (B) 4 Km/h
(C) 5 Km/h (D) 6 Km/h
(E) None of these

4. Walking at $\frac{2}{3}$ of his usual speed, Ravi reached office late by $1\frac{1}{2}$ hours from his house. What is the usual time taken by Ramesh to reach his office?
(A) 1.5 hours (B) 2 hours
(C) 2.5 hours (D) 3 hours
(E) None of these

5. Two places A and B are 300 km apart. Two cars approach each other, one at 32 km/h from A and the other at 28 km/h from B. How far is the two cars 1 min before meeting? (in meters)
(A) 700 (B) 1000
(C) 1250 (D) 1500
(E) None of these

6. A journey of 1200 km is done in a total of 12 hours, If 480 km is travel by train and remaining by bus. The same journey is done in 10 hours if 750 km is travel by train and remaining is done by bus. Find the ratio of the speed of train to bus.
(A) 5:3 (B) 7:3
(C) 1:1 (D) 4:1
(E) None of these

7. Anil starts cycling along the boundaries of the squares. He starts from a point A and after 90 minutes he reached to point C diagonally opposite to A. If he is travelling with 20km/hr, then find the area of square field.
(A) 150 (B) 225
(C) 350 (D) 455
(E) None of these

8. A and B are two places 60 km apart. Anil and Varun start towards each other at the same time and meet each other after 6 hour. If Anil travelled with $\frac{2}{3}$ of his speed and Varun travelled with double of his speed, they would have met after 5 hours. Find the speed of Anil.
(A) 3 km/h (B) 5 km/h
(C) 6 km/h (D) 9 km/h
(E) 12 km/h

9. A car driver, driving in a fog, passes a person who was walking at the rate of 2 km/h in the same direction. The person could see the car for 6 minutes and it was visible to him up to distance of 0.6 km. what was speed of the car?
(A) 30kmph (B) 15kmph
(C) 20kmph (D) 8kmph
(E) 12kmph

10. Ajay takes 6 hours in walking at certain place and return back. While it takes 4.5 hours in walking at certain place and riding back. If Ajay ride both sides, then find the time taken by Ajay?
(A) 3 hours (B) 3.5 hours
(C) 4 hours (D) 4.5 hours
(E) None of these

Solutions

1. Answer is option C
Explanation:
Let total distance = D
$\frac{3D}{5\times9}+\frac{2D}{5\times6}=\frac{40}{60}$
D= 5 Km

2. Answer is option A
Explanation:
First part of distance = $\frac{1}{4}$
Second part of distance = $\frac{1}{3}$
Third part of distance =$1-\frac{1}{4}-\frac{1}{3}=\frac{5}{12}$
Let total distance = 12D
First part = 3 D
Second part = 4 D
Third part = 5 D
Average speed = $\frac{12D}{\frac{3D}{45}+\frac{4D}{30}+\frac{5D}{25}}$
$=\frac{90D\times12}{36D}$
= 30 Km/h

3. Answer is option B
Explanation:
Radius = 350 m
Perimeter of the track = $2\pi r$
= $2\times\frac{22}{7}\times350$
= 2200 meters
= 2.2 km
Time = 33 min
$=\frac{33}{60}=\frac{11}{20}$ hours
Average speed = $\frac{2.2\times20}{11}$
= 4 km

4. Answer is option D
Explanation:
Distance = Speed × Time
Let Speed = S
Time = T
$S\times T=\frac{2}{3}S\times\left(T+\frac{3}{2}\right)$
$ST=\frac{2}{3}ST+S$
$\frac{1}{3}ST=S$
T = 3

5. Answer is option B
Explanation:
Distance = 300 km
Relative speed = 32+28 = 60 km/h
60 km travelled in 60 minutes.
1 km in 1 min
So, distance 1 min before impact
= 1000 meters

6. Answer is option B
Explanation:
Let speed of train = T
Let speed of Bus = B
Case 1
$\frac{480}{T}+\frac{720}{B}=12$
$\frac{40}{T}+\frac{60}{B}=1$

Case 2
$\frac{750}{T}+\frac{450}{B}=10$
$\frac{75}{T}+\frac{45}{B}=1$

$\frac{40}{T}+\frac{60}{B}=\frac{75}{T}+\frac{45}{B}$
$\frac{15}{B}=\frac{35}{T}$
T : B
7 : 3

7. Answer is option B
Explanation:
D = $20\times\frac{3}{2}$ = 30 km.
So side of square is 15km, so area – $225km^2$

8. Answer is option C
Explanation:
Solution: A →_______60Km_________← B
Let the speed of A= x kmph and that of B = y kmph;
According to the question;
X*6+y*6 = 60
Or, x+y = 10 --------- (i)
And,
{(2x/3)*5}+(2y*5) = 60
Or, 10x+30y = 180;
Or, x+3y = 18; ---------- (ii)
From equation (i)*3 - (ii)
3x+3y-x-3y = 30-18
Or, 2x = 12

Hence, x = 6 kmph.

9. Answer is option D

Explanation:

D = S × T

D = 0.6 km

Speed of pedestrian = 2 km/h

T = 6 Min

Let speed of Car= S

$0.6 = (S–2) \times \frac{6}{60}$

S+2 = 6

S = 8 km/h

In 6 minutes, the car goes ahead by 0.6 km.

Hence, the relative speed of the car with respect to the pedestrian is equal to 6 kmph.

Hence, Net speed of the car is 8 kmph.

10. Answer is option A

Explanation:

W + W = 6

W =3

W+ R = 4.5

R =1.5

So to ride both directions,

it will take 1.5+1.5 = 3 hours