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TIME AND DISTANCE

In this chapter we will deal with the problem related to time, distance, and speed of an object (car, bus, train, living being etc.)

I. SPEED

Speed of an object is the distance covered by it in a unit time.

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

II. UNIT OF SPEED

1. If distance is measured in km and time is measured in hours then the unit of speed is kilometer per hour (km/hr).

2. If distance is measured in metre and time is measured in second, then the unit of speed is metre per second (m/sec).

1. Conversion of Kilometre/hour into Metre/second

$$1 \text{ km} = 1000 \text{ m}$$

And

$$1 \text{ hour} = 3600 \text{ sec}$$

$$1 \text{ Km/hr} = \frac{1000}{36000} \text{ m/sec}$$

$$1 \text{ km/hr} = \frac{18}{5}$$

III. AVERAGE SPEED

Average speed of an object is defined as the ratio of total distance covered to total time taken.

$$\text{Average speed} = \frac{\text{Total distance covered}}{\text{Total time taken}}$$

IV. SOME USEFUL RELATIONS

$$1. \text{ Speed} = \frac{\text{distance}}{\text{time}}$$

$$2. \text{ Distance} = \text{speed} \times \text{time}$$

$$3. \text{ Time} = \frac{\text{distance}}{\text{speed}}$$

$$4. \text{ Average speed} = \frac{\text{Total distance covered}}{\text{Total time taken}}$$

SOME IMPORTANT POINTS

- 1) As speed inversely proportional to time, so if the ratio of the speed of a body is changing in a:b, then the ratio of the time taken by it for the same distance will be $\frac{1}{a} : \frac{1}{b}$ i.e. b : a.
- 2) If a distance covered by an object at the speed of x km/hr and the same distance is covered at the speed of y km/hr, then the average speed for the whole journey is $\frac{2xy}{x+y} \text{ km/hr}$
- 3) If an object covers a distance at x_1 km/hr in time t_1 and another object (or the same object) covers the same distance at x_2 km/hr in time t_2 , then

$$x_1 t_1 = x_2 t_2$$

$$\text{Or} \quad \frac{x_1}{x_2} = \frac{t_2}{t_1}$$





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SOLVED EXAMPLES

Q.1. Express 63 km /h into m/s ?

- A) 16.5 m/s
- b) 17.5 m/s
- c) 18.5 m/s
- d) 19.5 m/s

Q.2. Express 12.5 m/s into km/h

- a) 40 km/h
- b) 50 km/h
- c) 45 km/h
- d) 55 km / h

Q.3) A car is travelling at a speed of 50 km/h. The distance will it cover in 12 min is?

- a) 10 km
- b) 8 km
- c) 12 km
- d) 4.16 km

Q. 4) Cyclists cover 20 km in 2.5 hour. Find the speed of the cyclist?

- a) $20/9$ m/s
- b) $9/20$ m/s
- c) 8 km/h
- d) None of these

Q. 5) An athlete running 100m in 12 seconds. Then find the speed (in km/h) of the athlete.?

- a) 30
- b) 20
- c) 10
- d) 50

Q.6) A cyclist covers 750 m in 2 min 30 sec. what is the speed in km/h of the cyclist?

- a) 18 km/h
- b) 12 km /h
- c) 15 km/h
- d) 24 km/h

Q.7) A truck covers 368 km at a certain speed in 8 hours. Find the average speed of truck?

- a) 46 km
- b) 64 km

- c) 18 km
- d) 25 km

Q.8) Kiran covers a certain distance 80 km/h and returns to the same point at 20 km/h. Then the average speed during the whole journey be

- a) 35 km/h
- b) 32 km/h
- c) 30 km/h
- d) 28 km/h

Q.9. A man travelled from the village to the post-office at the rate of 25 km /hour and walked back at the rate of 4 km/h. if the whole journey took 5 h 48 min. find the distance of the post-office from the village

- a) 25 km
- b) 30 km
- c) 20 km
- d) 22 km

Q.10. If a man walks at the rate of 5 km/h he misses a train by 7 min. however, if he walks at the rate of 6 km/h, he reaches the station 5 min before the arrival of the train. Find the distance covered by him to reach the station.

- A) 5 km
- b) 6 km
- c) 8 km
- d) 6.5 km

Q.11. If a man runs at 6 km / h from his house. He misses the train at the station by 8 min. if he runs at 10 km/h he reaches the station 7 min earlier than the departure of the train. What is the distance of station from his house?

- a) 3500 m
- b) 3750 m
- c) 3250 m
- d) 3000 m





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Q 12. A student goes to school at the rate of $5/2$ km /h and reaches 6 minutes late. If he travels at the speed 3 km/h, he reaches 10 minutes earlier. The distance of the school is

a) 5 km b) 8 km
c) 2 km d) 4 km

Moderate Level Question

Q. 1. Speed of a moving car is 36 kilometer per hour. Find its speed in metre per second.

a) 10 m/sec b) 12 m/sec
c) 15 m/sec d) 18 m/sec

Q. 2. Find the time taken by a scooterist to cover 4.5 km at a speed of 12 m/sec.

a) $6\frac{1}{4}$ minutes b) $7\frac{1}{4}$ minutes
c) $8\frac{1}{4}$ minutes d) $5\frac{1}{4}$ minutes

Q. 3. An aero plane travels distances of 2500 km, 1200 km and 500 km at the rate of 500 km/hr, 400 km/hr and 250 km/hr respectively. Find the average speed.

a) 320 km/hr b) 400 km/hr
c) 420 km/hr d) 220 km/hr

Q. 4. A motor cyclist completes a journey in 10 hours, the first half at the rate of 21 kilometers per hour and the second half at the rate of 24 kilometers per hour. Find the total distance travelled.

a) 226 km b) 224 km
c) 238 km d) 232 km

Q. 5. Anirudh goes to office at the rate of $2\frac{1}{2}$ km/hr and reaches 6 minutes late. If he travels at the speed of 3 km/hr, he is 10 minutes early. What is the distance to his office?

a) 2 km b) 6 km
c) 8 km d) 4km

Q. 6. A starts walking from a place at a uniform speed of $3\frac{1}{2}$ km/hr. in a particular direction. After half an hour, B starts from the same place and walks in the same direction as A at a uniform speed and overtakes A after $2\frac{1}{4}$ hours. Calculate the speed of B.

a) $4\frac{5}{18}$ km/hr b) $4\frac{4}{8}$ km/hr
c) $5\frac{2}{5}$ km/hr d) 8 km/hr

Q. 7. A car travels 80 km per hour for the first one and a half hour. After first $1\frac{1}{2}$ hours, the car travels at 60 km/hr. Find the time taken by the car to travel 210 kilometres.

a) 2 hours b) 3 hours
c) 4 hours d) 5 hours

Q. 8. A train covers a distance between station A and station B in 45 minutes. If the speed of the train is reduced by 5 km/hr, then the same distance is covered





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in 48 minutes. What is the distance between station A and station B?

a) 60 km b) 40 km
c) 30 km d) 20 km

Q. 9. Walking $6/7$ th of his usual speed, a man is 12 minutes too late. Find the usual time taken by him to cover the distance.

a) 2 hours b) $1\frac{1}{5}$
c) $2\frac{1}{3}$ d) $3\frac{1}{7}$

Q. 10. A car travels a certain distance at 60 km per hour and returns over the same road at 40 km per hour. Find the average rate of travelling for round the trip in kilometers per hour.

a) 26 km/hr b) 32 km/hr
c) 42 km/hr d) 48 km/hr

Q. 11. A man starts by a motorcycle at the speed of 40 km/hr. After every hour he takes rest for 20 minutes. If he starts at 10.30 a.m. and has to go a distance of 130 kms, at what time will he reach the destination?

a) 5 hrs. 20 minutes
b) 4 hrs. 15 minutes
c) 2 hrs. 10 minutes
d) 6 hrs. 5 minutes

Q. 12. The distance between Agra to Delhi is 192 km. Travelling by express train, it takes 48 minutes less than another local

train. Calculate the speed of express train, if the speed of the two trains differ by 20 km.

a) 80 km/h b) 70 km/hr
c) 50 km/hr d) 56 km/hr

PRACTICE EXERCISE

1. A cyclist covers 91 km in $4\frac{1}{3}$ hours. His speed in metre per second is

a) $5\frac{1}{6}$ m/sec b) $6\frac{1}{5}$ m/sec
c) $5\frac{5}{6}$ m/sec d) $6\frac{2}{5}$ m/sec

2. The speed of a car is 54 km/hr. Its speed in meter per second is

a) 15 m/sec b) 18 m/sec
c) 20 m/sec d) 24 m/sec

3. The speed of a train is 4 m/sec. Its speed in km/hr

a) 14 m/sec b) 14.4 m/sec
c) 15 m/sec d) 15.5 m/sec

4. If a man running at 15 km/hr crosses a bridge in 5 minute, then the length of the bridge is

a) 1333.33 m b) 1000 m
c) 7500 m d) 1250 m

5. Lokesh runs at rate of 15.6 km per hour. How many meters does he run in 2 minutes?

a) 260 m b) 312 m
c) 520 m d) 1040 m





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6. A man performs $\frac{2}{25}$ of his total journey by bus, $\frac{21}{50}$ by car and the remaining 2 km on foot. His total journey is
 a) 2.5 km b) 3 km
 c) 3.5 km d) 4 km

7. A car is running at 42 km/hr. The time it will take to cover 350 m is
 a) 20 sec b) 30 sec
 c) 35 sec d) 40 sec

8. To walk one kilometer A takes m minutes and B takes n minutes. In one hour, the difference of distance travelled by A and B is
 a) $m - n$ b) $60 m - 60 n$
 c) $\frac{60}{m} - \frac{60}{n}$ d) $60mn$

9. A car can finish a certain journey in 10 hours at a speed of 48 km/hr. To cover the same distance in 8 hours, the speed of the car must be increased by
 a) 6 km/hr b) 7.5 km/hr
 c) 12 km/hr d) 15 km/hr

10. A truck covers a distance of 550 metres in one minute whereas a bus covers a distance of 33 km in $\frac{3}{4}$ hours. The ratio of their speed is
 a) 3 : 4 b) 1 : 2
 c) 2 : 3 d) 4 : 5

11. The ratio between the rates of walking of A and B is 2 : 3. If the time taken by B to cover a certain distance is 36 minutes, then the time taken by A in minutes to cover that much distance is
 a) 24 b) 38 c) 48 d) 54

12. Two persons start from the same place and walk in the opposite directions at 5 km and 4 km per hour respectively. At the end of 3 hours, distance between them is
 a) 12 km b) 15 km
 c) 27 km d) 31 km

13. A person starts from a place P at 6 A.M. and walks to Q at 3 km per hours. Another person starts from P at 8 A.M. and follows the first on bicycle at 6 km per hour. Both of them reach Q at the same time. The distance from P to Q is
 a) 12 km b) 10 km
 c) 8 km d) 6 km

14. Walking at $\frac{3}{4}$ of his usual speed, a man is $\frac{1}{2}$ hour late. His usual time is
 a) $7\frac{1}{2}$ hrs b) $3\frac{1}{2}$ hrs
 c) $3\frac{1}{4}$ hrs d) $\frac{7}{8}$ hrs

15. A walks at 4 km/hr and 4 hours after his start, B cycles after him at 10 km/hr.



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How far from the start does B catch up with A?

a) 16.7 km b) 18.6 km
c) 21.5 km d) 26.7 km

16. Two persons X and Y start at the same time from two places 54 km apart and travel towards each other. X's rate per hour is 3 km less than twice Y's rate. If they meet in 6 hours, the speed of X is

a) 4 km/hr b) 5 km/hr
c) 6 km/hr d) 8 km/hr

17. Two persons X and Y start at the same time from two places 54 km apart and travel towards each other. X's rate per hour is 3 km less than twice Y's rate. If they meet in 6 hours, the speed of Y per minute is

a) 4 km b) 60 m
c) 66.67 m d) 80.52 m

18. While walking at $4/5$ of the usual speed a man reaches 15 minutes late to his office. His usual time consumed in walking to office is

a) 50 minutes b) 60 minutes
c) 65 minutes d) 80 minutes

19. X and Y who are 48 km apart walk towards each other. X is walking at the rate of 7 km/hr and Y is walking at the rate of 9 km/hr. They will meet after

a) 5 hours b) 4 hours
c) 3.5 hours d) 3 hours

20. Rahul travelled 1200 km by air which formed $2/5$ of his trip. One-third of the whole trip, he travelled by car and the rest of the journey he performed by train. The distance travelled by train was

a) 480 km b) 800 km
c) 1600 km d) 1800 km

21. A man drives 150 km from A to B in 3 hours 20 minutes and returns to A in 4 hours 10 minutes. Then, average speed from A to B exceeds the average speed for the entire trip by

a) 5 km/hr b) 4.5 km/hr
c) 4 km/hr d) 2.5 km/hr

22. A thief steals a motor car at 1 p.m. and drives at 15 miles an hour. The theft is discovered at 2 p.m. and the owner sets off in another car at 18 miles an hour. He will overtake the thief at

a) 4 p.m. b) 5 p.m.
c) 6 p.m. d) 7 p.m.

23. Two trains start from station A and B and travel towards each other at speed of 50 km/hr and 60 km/hr respectively. At the time of their meeting the second train has travelled 120 km more than the first. The distance between A and B is

a) 990 km b) 1200 km





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c) 1320 km d) 1440 km

24. A man travels three-fifth of a distance AB at a speed of $3a$ and the remaining at a speed of $2b$. If he goes from B to A and back at a speed of $5c$ in the same time.

Then

a) $\frac{1}{a} + \frac{1}{b} = \frac{1}{c}$ b) $a + b = c$
 c) $\frac{1}{a} + \frac{1}{b} = \frac{2}{c}$ d) none

25. A man travels from A to B at a speed of x km/hr. He then rests at B for x hours. He then travels from B to C at a speed of $2x$ km/hr and rests at C for $2x$ hours. He moves further to D at a speed twice as that between B and C. He thus reached D in 16 hours. If distances A – B, B – C, C – D are all equal to 12 km, the time for which he rested at B could be
 a) 3 hours b) 6 hours
 c) 2 hours d) 4 hours

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