Lesson : 13. Motion and Time

Grade : VII

Basic concepts – A Flow Chart

Motion

Types of Motion

Uniform Motion

- An object moving along a straight line with a constant speed is said to be in uniform motion.
- The average speed is the same as the actual speed.

Non-uniform Motion

If the speed of an object moving along a straight line keeps changing. Its motion is said to be non-uniform.

Speed

- It is the distance covered by an object in a unit time.

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

- Basic unit of speed is m/s.

Measurement of Speed

- Speedometer in vehicles gives the speed in kilometers per hour.
- Odometer records the total distance covered by a vehicle.

Distance – Time Graph

- Motion of objects can be presented in pictorial form by their distance-time graphs.
- The distance-time graph for the motion of an object moving with a constant speed is a straight line.

Measurement of Time

- Time between one sunrise and the next is a day.
- Time between one new moon and other is a month.
- The time taken by the earth to complete one revolution of the sun is year.
- Clocks or watches are perhaps the most common time measuring devices.
- Periodic motion of a pendulum and watches.

Simple Pendulum

- The to and fro motion of a simple pendulum is an example of a periodic or an oscillatory motion.
- The metallic ball of the pendulum is called the bob.
- The time taken by the pendulum to complete one oscillation is called its time period.

Know the Terms

- **Meter** : The standard unit of length.
- **Oscillation** : Periodic movement of an object is called oscillation.
- **Pendulum** : A weight hung form a string.
- **Speed** : Speed = $\frac{\text{Total distance covered}}{\text{Total time taken}}$
- **Time period** : The time taken by the pendulum to complete one oscillation is called its time period.

Objective Type Questions

(1 Mark each)

I. Multiple choice questions

1. The motion of pedal of a bicycle is?

   a. Circular b. Periodic c. Straight line d. Oscillatory

2. Speed is ;

   a. Distance x time b. Distance / time c. Distance + time d. Distance – time

3. Distance is a ;

   a. Vector quantity b. Scalar quantity c. Both (a) and (b) d. None of these

4. In a graph, on which axis dependent variable is shown?

   a. x b. y c. On any axis d. Depends on data

5. One millionth second is :

   a. Microsecond b. Nanosecond c. Picosecond d. None of these

6. A solar day is;

   a. 24 h b. 1440 min c. 86400 sec d. all of these

7. The distance moved by the vehicle is measured by;

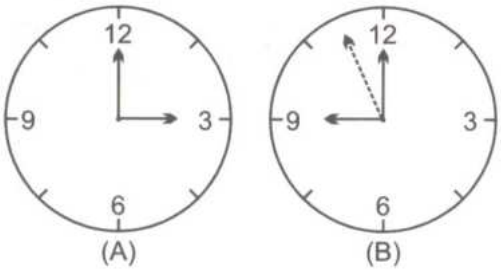
   a. Odometer b. galvanometer c. speedometer d. thermometer

8. Which of the following cannot be used for measurement of time?

   a. A leaking tap b. Simple pendulum

   c. Shadow of an object d. blinking of eyes

9. Tow clocks A and B are shown in following fig. clock A has an hour and a minute hand, Whereas clock B has an hour hand, minute hand as well as a second hand. Which of the following statement is correct for these clocks?



a. A time interval of 30 seconds can be measured by clock A

b. A time interval of 30 seconds cannot be measured by clock B

c. Time interval of 5 minutes can be measured by both A and B

d. Time interval of 4 minutes 10 seconds can be measured by clock A

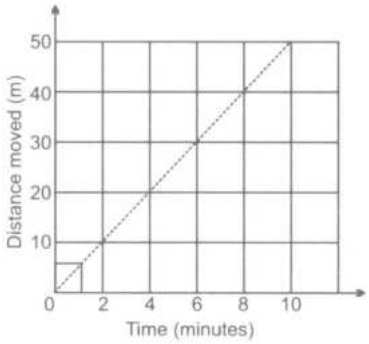
10. Two students were asked to plot a distance- time graph for the motion described by table A and table B.

Table A

Distance move (m)	0	10	20	30	40	50
Time minutes	0	2	4	6	8	10

Table A

Distance move (m)	0	5	10	15	20	25
Time minutes	0	1	2	3	4	5



The graph given in above figure is true for ;

a. Both A and B b. A only c. B only d. neither A nor B

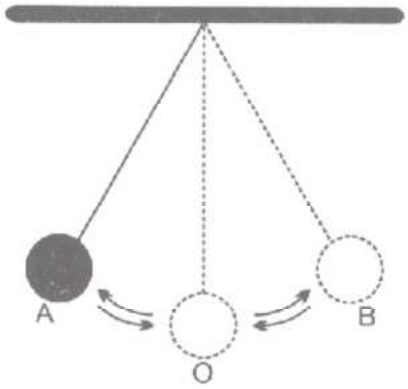
11. A bus travels 54 km in 90 minutes. the speed of the bus is :

a. 0.6m/s b. 10 m/s c. 5.4 m/s d. 3.6 m/s

12. If we denoted speed by S, distance D and time by T, the relationship between these quantities is ;

a. S = DT b. T = $\frac{S}{D}$ c. S = $\frac{1}{1}$ x d d. S = $\frac{T}{D}$

13. Observe following figure:

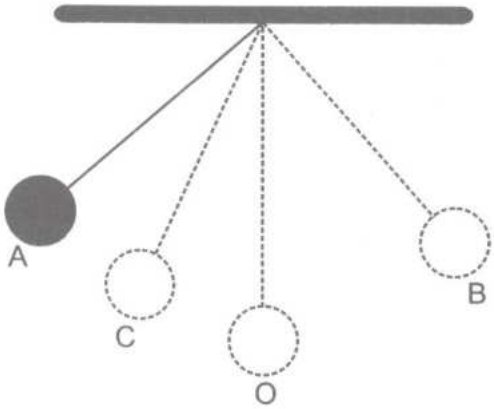


The time period of a simple pendulum is the time taken by it to travel from:

a. A to B and back to A b. O to A, A to B and B to A

c. B to A,A to B and B to O d. A to B

14. Following figure shows an oscillating pendulum:



Time taken by the bob to move from A to C is t_1 and from C to O is t_2. The time period of this simple pendulum is;

a. $(t_1 + t_2)$ b. $2(t_1 + t_2)$ c. $3(t_1 + t_2)$ d. $4(t_1 + t_2)$

15. The correct symbol to represent the speed of an object is:

a. 5 m/s b.5 mp c. 5 m/s^{-1} d. 5 s/m

16. Boojho walks to his school which is at a distance he finds that the school is closed and comes back by a bicycle with his friend and reaches home in 20 minutes. His average speed in km/h is :

a. 8.3 b. 7.2 c. 5 d. 3.6

1. a	2. b	3. b	4. b	5.a	6. d	7. a	8. d
9. c	10. a	11. b	12. c	13. a	14. d	15. a	16. b

II. Multiple choice questions

1. What part of second is called nano-second?

(a) One hundredth (b) One thousandth

(c) One millionth (d) One billionth

2. Which of the following records the distance travelled by the vehicles?

(a) Manometer (b) Odometer

(c) Speedometer (d) Motometer

3. The relation between speed and displacement is

(a) Displacement = Speed/ Time (b) Displacement = Speed x Time

(c) Displacement = Time / Speed (d) None of these

4. On which axis is dependent variable represented ?

(a) X-axis (b) Y- axis

(c) On any axis (d) Depends on the data

5. Time period of a simple pendulum depends upon

(a) Weight of bob (b) Length of pendulum

(c) Both (d) None of above

1. d	2. b	3. b	4. b	5. b

I. Fill in the blanks

1. The distance covered by an object in _____ is called its speed.

2. The symbols of all units are written in _____.

3. The unit of speed is _____.

4. _____is used for measuring speed.

5. shadow of an object is _____ at noon.

6. Roman used _____ to measure time.

7. A _____ is one billionth of a second.

8. The standard unit of time is _____.

9. Motion and _____ are relative terms.

10. _____ motion is used in clocks.

1. Unit time	2. Singular	3. m/s	4. Speedometer	5. Shortest
6. Sand clocks	7. nanosecond	8. Second	9. Rest	10. Periodic

II. Fill in the blanks

(i) The time taken by a simple pendulum to complete one oscillation is called its _____.

(ii) Time period of a pendulum depends on its _____.

i. time period	ii. length

I. Match the following.

Column A		Column B	
(i)	Day	(a)	Second
(ii)	Month	(b)	m/s
(iii)	Time	(c)	metre
(iv)	Speed	(d)	The time from one sunrise to the next
(v)	Distance	(e)	One new moon to the next

i. d	ii. e	iii. a	iv. b	v. c

II. Match the following.

Colum A	Column A
a. Month	i. Speed
b. Speedometer	ii. Oscillation
c. Sundial	iii. m/s
d. Sand Clock	iv. Device to measure distance travelled by vehicle
e. Odometer	v. Romans
f. Speed	vi. Jantar Mantar
g. Pendulum	vii. Device to measure speed
h. Movement of object in unit time	viii. One new moon to the next

a. viii	b. vii	c. vi	d. v	e. iv	f. iii	g. ii	h. i

I. True or False

(i) The basic unit of time is second

(ii) The object moving along a straight line keeps changing its speed, its motion is called uniform.

(iii) The symbols of units are written in plural

(iv) Faster vehicle has a higher speed

(v) The age of a person is expressed in days.

(i) True	(ii) False	(iii) False	(iv) True	(v) False

Quiz Time

1. Name the physical quantity which helps to know which object is faster or slower.

2. If we say that a train is moving 40 kilometres per hour, what do you mean by this statement?

3. Write the basic unit of time?

4. Name the most common device which is used to measure the time.

5. An object changes its position with respect to an other object. What is this process called?

6. Give an example of a device which shows periodic motion.

7. Write the formula to calculate speed

8. What are the factors which affect the time period of a simple pendulum?

9. Name any two types of graphs

10. Name the device which is used to record the speed directly in km / h in vehicles.

1. Speed

2. It means that train cover 40 km in one hour

3. Second

4. Watch or clock

5. Motion

6. Simple Pendulum

7. Speed =Distance/ Time

8. (i) Length of Pendulum

   (ii) Acceleration due to gravity

9. (i) Bar graph

   (ii) Line graph

10. Speedometer

NCERT CONRNER

Intext Question

1. Complete the table:

Table 13.1 some examples of different type of motion

Example of motion	Type of motion
	Along a straight line/ circular/ periodic
Soldiers in a march past	Straight line

Bullock cart moving on a straight road	Straight line
Hands of an athlete in a race	Periodic
Pedals of a bicycle in motion	Circular
Motion of the earth around the sun	Circular/ Periodic / revolutional
Motion of a swing	Periodic
Motion of a pendulum	Periodic

1. Which vehicle is moving the fastest of all?

Blue one .

2. Which one of them is moving the slowest of all?

Red one.

3. Would you say that the bus is moving faster than the bicycle?

Yes.

4. Have you ever wondered how clock and watches measure time?

All of them make use of some periodic motion.

5. Time periodic of a simple pendulum.

Length of the string = 100 cm

S.No	Time taken for 20 oscillations	Time period
1.	42 s	2.1 s
2	40 s	2.0 s
3.	41 s	2.05s

6. Boojho is wondering how many seconds there are in a day and how many hours in a year. Can you help him?

1 day = 24 x 60 x60 s = 68,400 s

1 Year = 365 x60x24 x60 s = 31,536,0000 s

7. Paheli wondered how time was measured when pendulum clocks were not available.

Many time measuring devices were adapted in different parts of the world before the pendulum clock were invented. Sundials, water clocks and sand clocks are concrete examples, of such devices.

8. Distance moved and time taken by a moving ball

Name of the group	Distance moved by the ball (m)	Time taken (S)	Speed = Distance/ Time taken (m/s)
A	50	5	50/5=10
B	70	7	70/7=10
C	40	8	40/8=10
D	100	4	100/4 =25
E	80	10	80/10=8

9. Rockets, launching satellites into earth's orbit, often attain speeds up to 8 km/s. on the other hand, a tortoise can move only with a speed of about 89 cm/s calculate how fast is the rocket compared with the tortoise ?

Speed of rocket $= 8\ km/s = 8000\ m/s$

$$\frac{Speed\ of\ rocket}{Speed\ of\ tortise} = \frac{8000\ m/s}{80/100\ m/s}$$

$$= \frac{8000 \times 100}{80}$$

$$= 9000$$

10. Boojho wants to know whether there is any device that measures the speed.

Yes, Speedometer

11. Can you tell how far is the picnic spot from the school?

80 km.

12. Can you calculate the speed of the bus?

$Distance = 80\ km$

$Time = 8:00\ AM - 10:00\ AM$

$= 2\ hrs$

$$speed = \frac{Distance}{Time} = \frac{80\ km}{2\ hrs}$$

$= 40\ km/hr$

13. How much is this distance in km?

10 km

14. Can you now help Paheli to find the distance moved by the bus at 9 : 45 AM?

70 km

15. Can you also find the speed of the bus from its distance-time graph?

70 km

Distance travelled = 80 km

Time required = 8 ; 00 AM – 10 :00 AM

= 2hrs

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

$= \frac{80\ km}{2\ hr}$

= 40 km/hr

Text Question

1. Classify the following as motion along a straight line, circular or oscillatory motion:

i. Motion of your hands while running.

ii. Motion of a horse pulling a cart on a straight road.

iii. Motion of a child in a merry-go-round.

iv. Motion of a child on a see-saw.

v. Motion of the hammer of an electric bell.

vi. Motion of a train on a straight bridge.

i. Oscillatory ii. Straight line iii. Circular, iv. Oscillatory

v. Oscillatroy vi. Straight line.

2. Which of the following are not correct?

i. The basic unit of time is second.

ii. Every object moves with a constant speed.

iii. Distance between two cities are measured in kilometes .

iv. The time period of a given pendulum is not constant.

v. The speed of a train is expressed in m/h.

ii, V

3. A simple pendulum takes 32 s to complete 20 oscillations. What is time period of the pendulum?

Time taken for 20 oscillation = 32s

Time taken for 1 oscillation $= \frac{32s}{20}$ = 1.65

4. The distance between two stations is 240 km. A train takes 4 hours to cover this distance. Calculate the speed of the train.

Distance = 240 km

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

Speed = $\frac{240\ km}{4\ h}$

= 60 km/ h

5. The odometer of a car reads 57, 321.0 km when the clock shows the time 08.30 AM. What is the distance moved by the car, if at 08 : 50 AM, the odometer reading has changed to 57,336.0 km? Calculate the speed of the car in Km/ min during this time. Express the speed in km/ h also.

Odometer reading at 8.30 AM = 57321.0 km

Odometer reading at 8.50 AM = 57336.0 km

Odometer reading = (57336.0 – 57321.0 km

= 15.0 km.

Time taken = 8: 50 Am - 8 : 30 Am

= 20 min

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

= $\frac{15\ km}{20\ min}$

= 0.75 km/ min

Speed in km/ h = $\frac{0.75\ km}{\frac{1}{60}\ h}$ $\left(i \min = \frac{1}{60}\ h\right)$

= 0.75 x 60 km/ h

= 45 km/ h.

6. Samla takes 15 minutes from her house to reach her school on a bicycle . if the bicycle has a speed of 2 m/ s, calculate the distance between her house and the school.

Speed = 2 m/ s

Time = 15 min = 15 x 60 s

= 900 s

Distance = Speed x time

= 2 m/ s x 900 s

= 1800 m

= $\frac{1800}{1000}\ km$

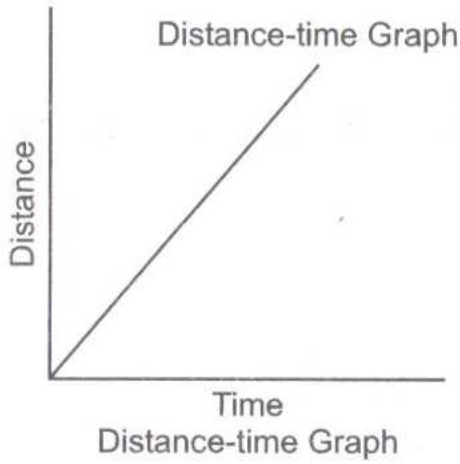
= 1.8 km

7. Show the shape of the distance – time graph for the motion in the following cases:

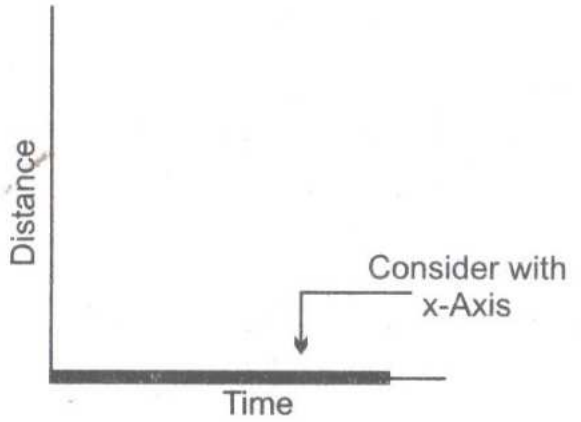
i. A car moving with a constant speed.

ii. A car parked on a side road.

(i)



Distance-time Graph



8. Which of the following relations is correct?

i. Speed = Distance x Time

ii. Speed = $\frac{Distance}{Time}$

iii. Speed = $\frac{Time}{Distance}$

iv. Speed = $\frac{1}{Distance \times Time}$

ii. Speed $\frac{Distance}{Time}$

9. The basic unit of speed is:

i. Km/min ii. m/min iii. 15 km iv. m/s

(iv) m/s

10. A car moves with speed of 40 km/h for 15 minutes and then with a speed of km/h for the next 15 minutes. the total distance covered by the car is

i. 100 km ii. 25 km iii. 15 km iv 10 km

Distance travelled in first 15 min = speed x time

= 40 km/ h x 15

$= \frac{40\ km}{h} \times \frac{15}{60}\ h$

= 10 km

Distance travelled in last 15 min

= Speed x Time

= 60 km/ h x 15 min

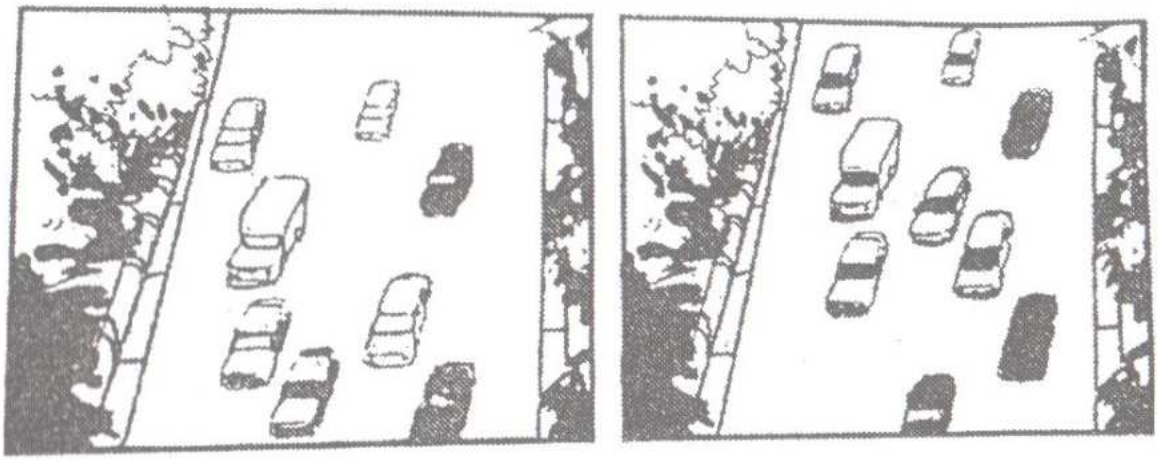
= 60 km / h x $\frac{15}{60}$ h

= 15 km

Total distance = (10 + 15)

= 25 km

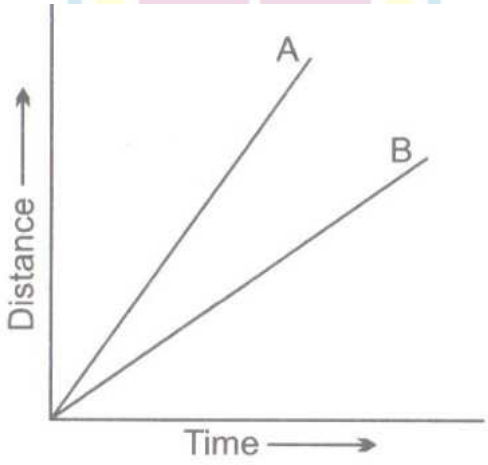
11. Suppose the two photographs, shown in Fig. A and Fig. B, had been taken at an interval of 10 seconds. If a distance of 100 metres is shown by 1 cm inThese photographs, calculate the speed of the blue car.



Vehicles moving in the position of vehicles shown same direction on a road in shown in after some time

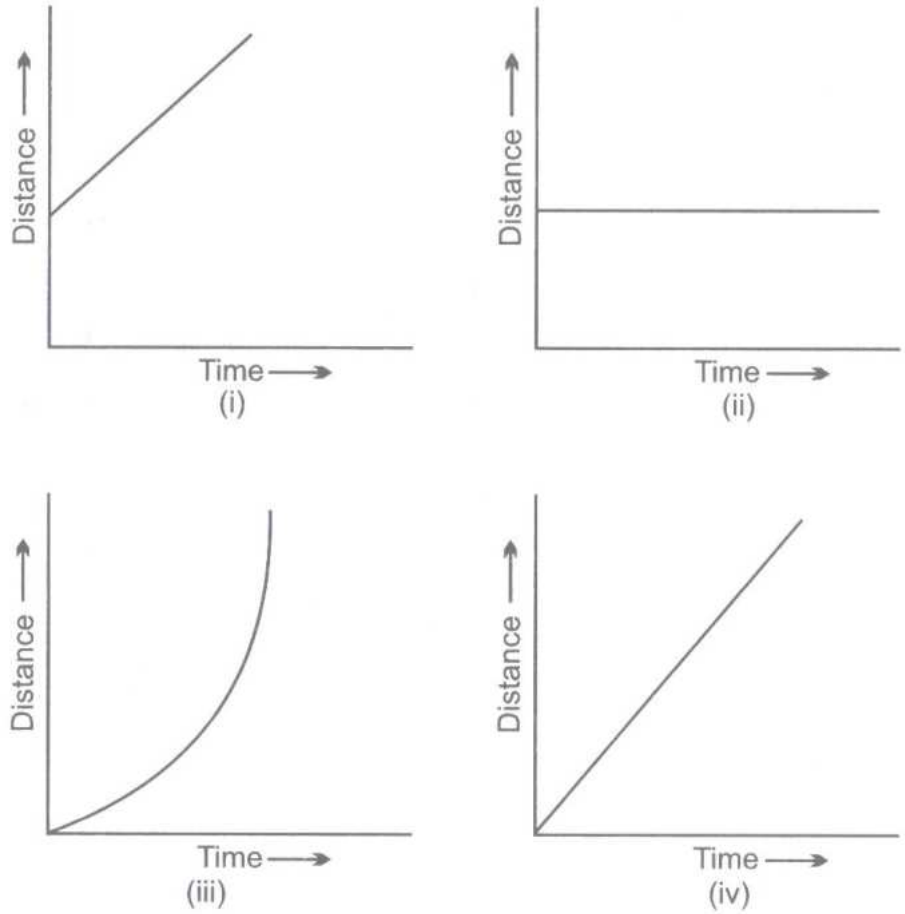
Speed = 100 m/ 10s = 10 m/ s

12. Figure shows the distance – time graph for the motion of two vehicles A and B which one of them is moving faster?



Answer : (A)

13. Which of the following distance- time graphs shows a truck moving at the speed which is not constant?



Ans: (iii)

I. Very short Answer type question.

1. What is motion?

When a body changes its position continuously with respect to time other body, then it is said to be in motion.

2. How many types of motion are there? Name them

(1) Translatory motion 2) Rotatory motion 3) Rolling motion 4) Periodic motion 5) Oscillatory and vibratory motion

3. Name the physical quantity which helps to know which object moves faster or slower?

Speed

4. What is speed?

The distance covered by a object in a unit time is called its speed

5. What is the basic unit of speed?

Metre / second

6. What do you mean when you say that a car is moving with a speed of 50 kilometres per hour?

It means that the car will cover 50 kilometres distance in one hour.

7. What is the basic unit of time?

Second

8. How did our ancestors find out the time of the day?

Our ancestors could tell the approximate time of the day by looking at shadows

9. What time interval was called as day by our ancestors?

The time interval between one sunrise to the next sunrise was called a day

10. How did our ancestors measure time interval of a month?

A month was measured from one new moon to the next.

11. What was a year as per our ancestors?

A year was fixed as the time taken by earth to complete one revolution of the sun.

12. What are the most common devices used to measure time?

Clocks or watches are most common time –measuring devices

13. What is the common property of most of the clocks?

All of them make use of some periodic motion

14. Give an example of periodic motion

One of the well-known periodic motion is that of a simple pendulum is called bob.

15. What is a bob?

The metallic ball in simple pendulum is called bob.

16. What is the time period of a simple pendulum?

The time taken by the pendulum to complete one oscillation is called its time period

17. What is the relation between speed distance and time?

Distance covered = Speed x Time

18. What are the factors that affect the time period of a simple pendulum?

(i) Length of pendulum (ii) Acceleration due to gravity

19. Name the devices used by your ancestors to measure the time before pendulum clocks

Sundials, water clocks, sand clocks

20. What is Speedometer ?

The device which is used to record the speed directly in km/h in the vehicles is called speedometer.

21. What is the function of odometer?

Odometer is used to measure the distance moved by the vehicle

22. What are x and y axis in a graph?

The horizontal line in a graph is called x-axis and vertical line is called y-axis

23. What is origin in a graph?

The point where the x-axis and y axis both intersect each other is called origin of graph

24. What is the independent variable?

The variable which increases or decreases freely and does not depend on other variables is called independent variable

25. On which axis dependent variables are represented?

The dependent variable are represented on y-axis

26. How many types of graphs are there?

There are following types of graphs

(i) Bar graph (ii) Line graph) (iii) Pie chart

27. What is simple pendulum?

The simple device consists of a small metallic ball and at the end of thin thread is called simple pendulum.

28. What is length of pendulum?

The length of the thread including radius of bob is called length of the pendulum.

29. What is the ratio of time taken to complete various oscillations?

The pendulum of a given length takes always same to complete one oscillation

30. Name the device which is used to measure speed

Speedometer

31. Name the device which is used to measure distance travelled

Odometer

32. Name two types of axis in the graph

i) X-Axis ii) Y-Axis

II. Very short Answer type question.

1. Define motion.

Motion is the change in the position of a body with respect to its surrounding and time.

2. When does a motion become uniform or non- uniform?

When a body covers equal distance in equal interval of time, the motion is uniform, but if it covers unequal distance in a given time, it is non- uniform motion.

3. Define speed.

Speed is the distance covered by a body in a unit time or it is equal to distance travelled divided by time. $s = \frac{d}{t}$

4. What are S.I units of time and speed?

The S.I unit of time is second (s) and that of speed is meter per second (ms^{-1}).

5. Name some ancient clocks used by our ancestors.

Our ancestors used sundial, sand clock or candle clock to meaure time.

6. What is a stop watch?

Stop watch can measure time up to fraction of second and can be stopped or started at any moment.

7. What is a simple pendulum?

A simple pendulum consists of a small non- magnetic ball like body suspended by a light string.

8. What device are fitted in vehicles to record speed or distance?

Odometer is fitted to record the distance covered and speedometer is fitted to record the speed of the vehicle at any moment.

9. What is the principle on which most of the clocks works?

Most of the clocks work on the principle of periodic motion.

10. On what factors the time period of pendulum depends?

Periods of a pendulum depends upon – (i) length of the pendulum and (ii) Acceleration due to gravity.

11. What do you mean by a graph?

A simple graph can give the relation between two variable, e.g., distance and time.

12. What do you mean by origin of graph?

The origin of a graph is the intersection point of two axes.

13. What is solar day?

The gap between two consecutive noons is taken as the unit of time called solar day. It is equal to 24 hrs.

14. A Simple pendulum takes 45 sec to complete 30 oscillations. What is the time period of the pendulum?

Time taken to complete 30 oscillations = 45 sec

Time taken to complete 1 oscillation = 45/30 = 1.5 sec.

One oscillation = Time period = 1.5 sec.

15. Paheli and Boojho have to cover different distances to reach their school but they take the same time to reach the school. what can you say about their speed?

Their speed will not be same.

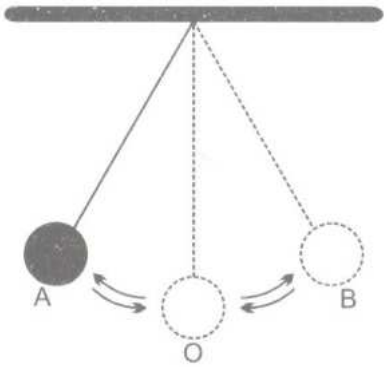
16. A spaceship 36,000 km in one hour. Express its speed in km/s.

Speed $= \frac{distance}{Time} = \frac{36000}{60 \times 60}$ = 10 km/sec

17. If Boojho covers a certain distance in one hour and Paheli covers the same distance in two hours, who travels in a higher speed?

Boojho moves at a higher speed as he covers the same distance in a lesser time than Paheli.

18. A simple pendulum is oscillating between two points A and B as shown in figure. Is the motions of the bob uniform or non- uniform.



Non-uniform motion.

III. Very short Answer type question.

1. Define speed.

Speed is defined as the ratio of the total distance travelled by a body to the total time taken.

2. Which speed is greater: 30 m/s or 30 km/h?

30 m/s

3. What is a pendulum?

A pendulum is a device which has a metallic ball (called bob) suspensed by a long thread from a rigid support.

4. What is the advantage of distance-time graphs?

It is useful in calculating the speed of the object and also tells the type of its motion.

5. Define time period of a simple pendulum.

The time period of the simple pendulum is defined as the time required by the pendulum to complete one oscillation.

6. The distance-time graph of an object is a straight line perpendicular to the distance axis. What does this graph indicate about the motion of the object?

It indicates that the object is not moving (stationary).

I. Short Answer type question.

1. Distinguish between uniform and non-uniform motion.

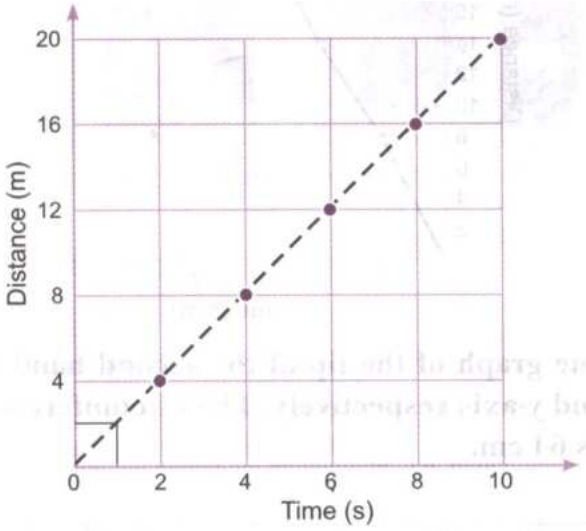
If a body covers equal distance in interval of time, it is said to be in a uniform motion. For example, a car moving along a straight line. If a body covers unequal distance in un equal intervals of time, it is said to be in non-uniform motion. For example, a racing horse.

2. Explain with the help of an example that the states of rest and motion are relative terms.

When you are driving a car, the car is said to be in motion because it is moving relative to the road but you are said to be at rest because you are at rest relative to the moving car.

3. Complete the data of the table given below with the help of the distance-time graph given in figure.

Distance (m)	0	4	?	12	?	20
Time (s)	0	2	4	?	8	10



Distance (m)	0	4	8	12	16	20
Time (s)	0	2	4	6	8	10

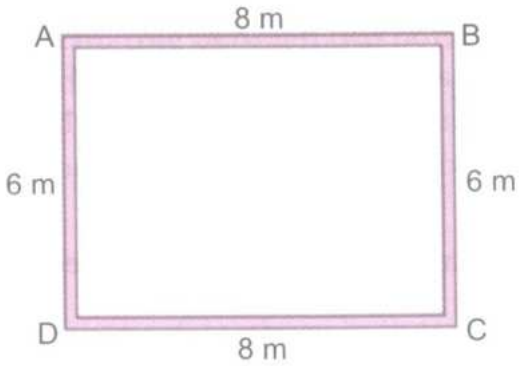
4. The average age of children of Class VII is 12 years and 3 months. Express this age in seconds. **(NCERT Exemplar)**

12 years 3 months = 12 x 365 x 3 x 30 = 4470 days

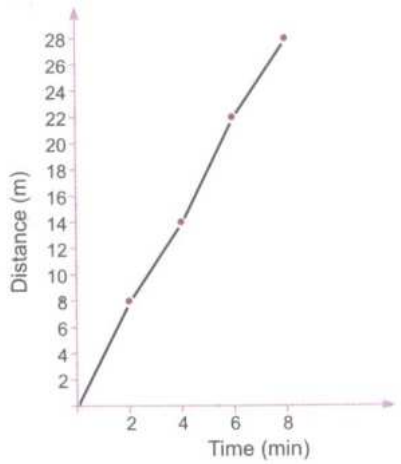
= 4470 x 24 x 60 x 60 s

= 386208000 s

5. Starting from A, Paheli moves along a rectangular path ABCD as shown in figure below. She takes 2 minutes to travel each side. Plot a distance time graph and explain whether the motion is uniform or non-uniform. **(NCERT Exemplar)**

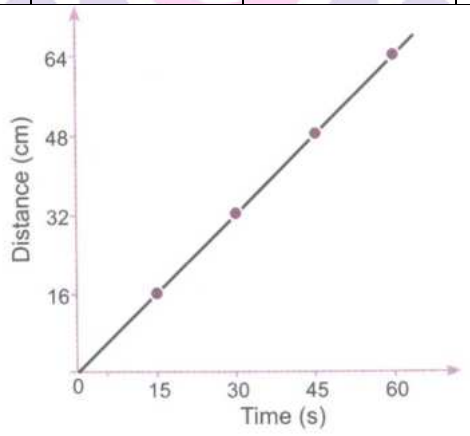


Since the distance covered per unit time for the entire distance covered is not the same, the motion is non-uniform.

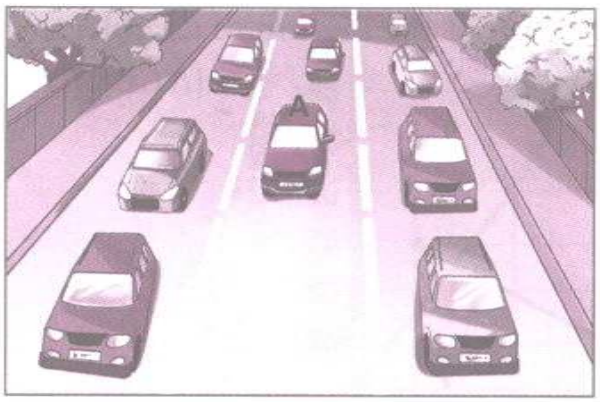


6. Plot a distance time graph of the tip of the second hand of a clock by selecting 4 points on x-axis and y-axis respectively. The circumference of the circle traced by the second hand is 64 cm. (NCERT Exemplar)

Time (s)	x	15	30	45	60
Distance (cm)	y	16	32	48	64



7. Suppose the two photographs, shown in figures given below, had been taken at an interval of 10 seconds. If a distance of 100 metres is shown by 1 cm in these photographs, calculate the speed of the car marked A. (NCERT)



The distance covered by the car from one strip to another, while is measured by scale is 1.4 cm.

Given, 1 cm is equivalnet to 100 m.

Therefore, 1.4 cm is equivalent to 140.

Distance travelled by the car = 140 m

Time interval between the two photographs = 10 s

$$\text{Speed} = \frac{Distance\ covered}{Time\ taken} = \frac{140}{10} = 14\ m/s$$

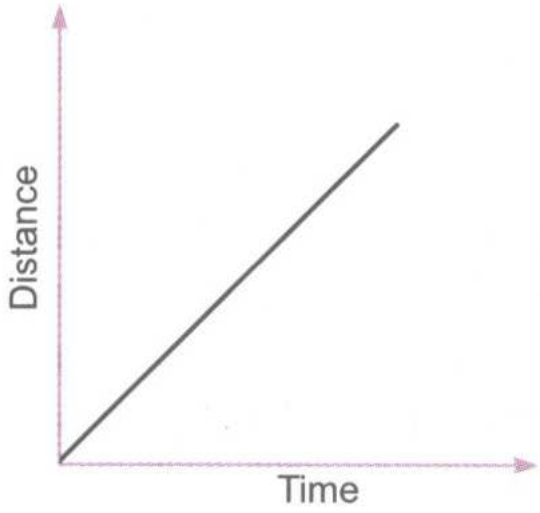
8. Show the shape of the distance time graph for the motion in the following cases.

(NCERT)

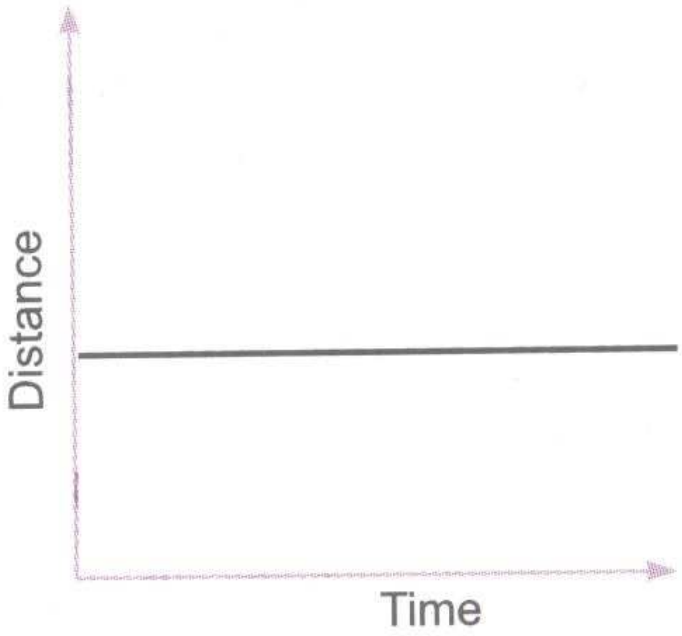
a. A car moving with a constant speed.

b. A car parked on a side road.

a. A car moving with a constant speed covers equal distance in equal intervals of time.



b. The distance – time graph of a car parked on a road side is such that with the increase in time, there is no change in distance.



II. Short Answer type question.

1. What do you mean by average speed?

The total distance covered by an object divided by the total time taken is called average speed.

Average speed = Total distance covered / Total time taken

2. Explain uniform and non- uniform motion

Uniform Motion : If an object is moving along a straight line with a constant speed, then the motion of object is called uniform motion. The bus moving at constant speed then the motion of objects is called uniform motion. The bus moving at constant speed is an example of uniform motion.

Non-uniform motion : If the speed on an object moving along a straight line keeps changing, its motion is said to be a non-uniform motion. For example movement of bus or car.

3. What is an oscillation?

An oscillation is the movement of a pendulum from its one extreme position to the other extreme position and then back to the former position.

4. Complete the following table for a pendulum at different places and calculate average time

period of the pendulum

Table 13.1 : Time period of a simple pendulum Length of the string = 100 cm

S.No.	Time taken for 20 oscillations	Time period
1	42 s	2.1 s

Ans :

S. No.	**Time taken for 20 oscillations**	**Time period**
1	42 s	2.1 s
2	40s	2s
3	38 s	1.9 s

Average time period $= \frac{2.1+2+1.9}{3} = \frac{6}{3} = 2s$

5. Explain how Galileo contributed to the development of clocks.

Once Galileo was sitting in a church . He noticed that a lamp suspended from the ceiling with chain was moving slowly from one side to other. He was surprised to find that his pulse beat the same number of times during the interval in which the lamp completed one oscillation. He found that a pendulum of a given length takes always the same time to complete one oscillation. This observation led to the development of pendulum clocks and other watches.

6. On the basis of the following table, calculate the speed of the car between 9.00 AM to 10 AM time interval

Table 13.2 : Odometer reading at different times of the journey

Time (AM)	**Odometer reading**	**Distance from the starting point**
8.00AM	36540 km	0 km
8.30 AM	36560 km	20 km
9.00 AM	36580 km	40 km
9.30 AM	36600 km	60 km
10.00 AM	36620 km	80 km

Initial time = 9.00 AM

Final time = 10.00 AM

Initial reading = 36580 km

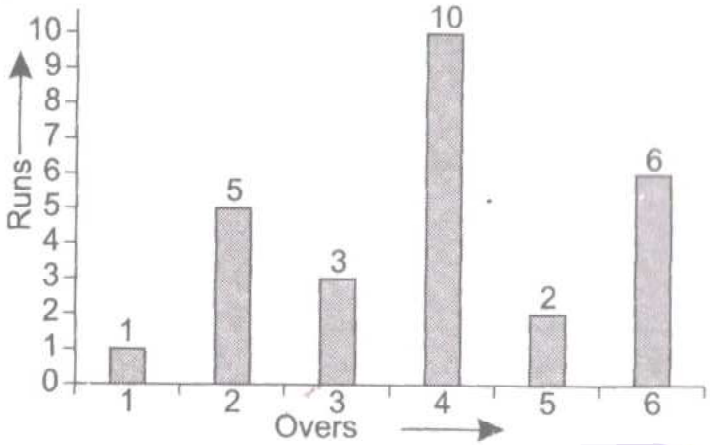
Final reading = 36620 - 36580 = 40 km

Total time taken = 10 AM – 9 AM = 14 h

We know that speed = Total distance cover / total time taken

= 40 km/ 1.00 h = 40 km / h

7. In a cricket match a team scored 1,5,3,10,2 and 6 runs in first 6 overs respectively. Show these runs by a bar graph.



8. How can you select a suitable scale to draw a graph?

The points to be kept in mind while choosing the most suitable scale to drawing graph are:

i) Difference between highest and lowest valued of each quantity

ii) Intermediate values of each quantity

iii) To utilise the maximum part of the paper on which the graph is to be drawn,

II. Short Answer type question- I

1. Given below a table showing time taken by a car to travel various distances.

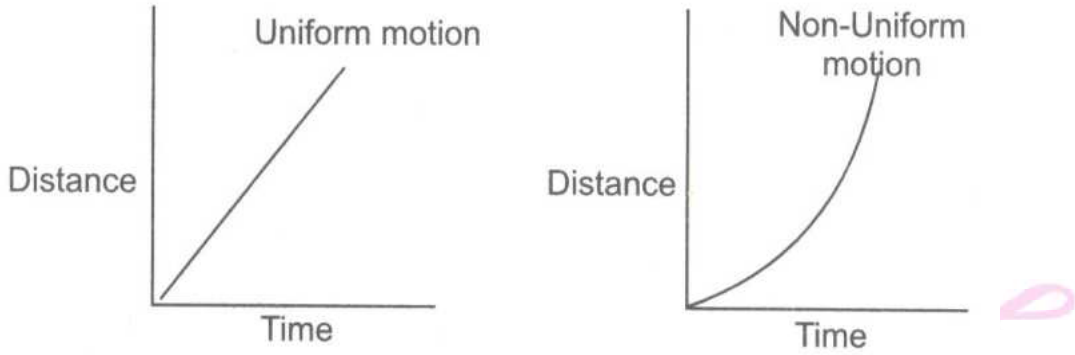
Time (min)	Distance (km)
0	0
10	5
20	10
30	20
40	30
50	35
60	45

What do you infer form this data?

We see that the car cover a distance of 5 km in first 10 min. it again covers a distance of 5 km in next 10 min. in the next 10 min, it covers 10km, then again 10 km in 10 min. then it

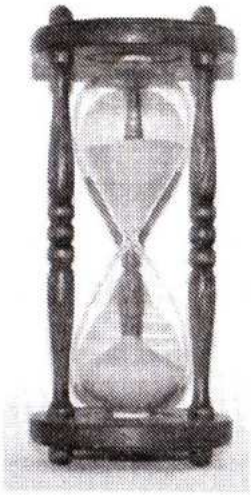
covers 5 km in 10 min. this shows that the car travels unequal distances in various slots of 10 min. So we conclude that the car is moving with a non- uniform speed.

2. Give the nature of distance- time graph both for uniform motion and non- unform motion.



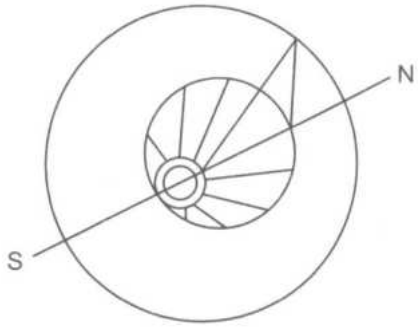
3. What is a sand clock?

Sand clock is a clock used by Romans to measure a constant time called hour, it consists two chambers fitted over one another filled with an amount of sand and it takes exactly one hour to empty a chamber. Once the upper chamber is completely emptied, the chamber is turned upside down to record the time again. It is also called hour glass.



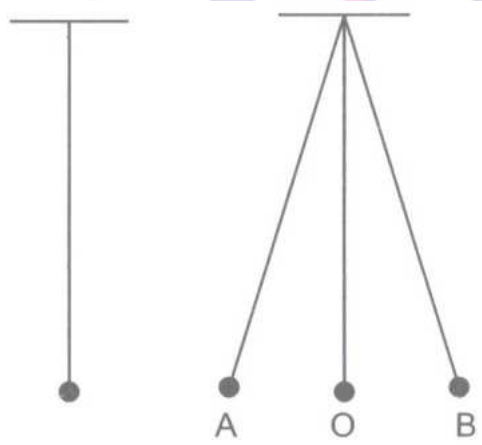
4. What is a sundial?

A sundial consists of triangular metallic plate called gnomon fixed vertically at the centre of a circular plate. The device is placed in the open in such a way that gnomon points in the north – south direction. it works on the principle that as position of sun in the sky changes, the position and length of shadow also changes, these are calibrated with time.



5. What is a simple pendulum? What is the time – period of a pendulum?

A simple pendulum has a small metallic ball called bob suspended from a rigid stand by a thread the time taken by the pendulum to complete one oscillation is called time period. One oscillation of a pendulum is completed when the bob moves from postion o to A and then from A to B and then back to A or from A to B to A.

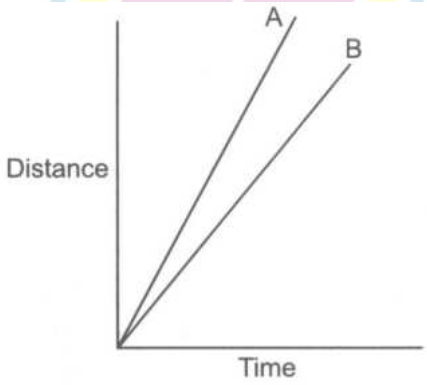


6. Differentiate between uniform and non- uniform motion.

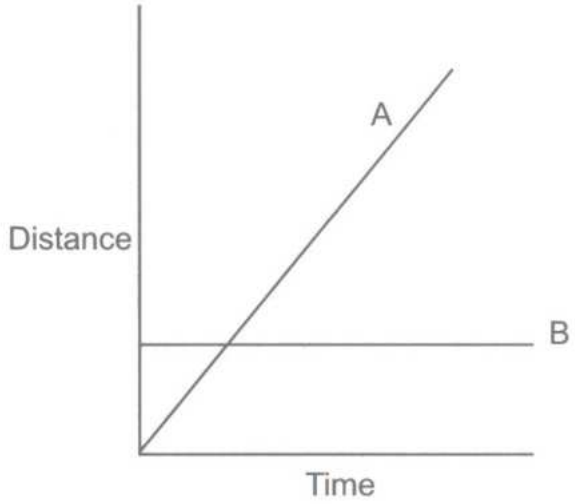
When a body moves with a constant speed i.e., it covers equal distances in equal interval of time, the motion is said to be uniform.

Non- uniform motion is the different distances covered in equal interval of time. Such a body moves with a variable speed.

7. a. Which of the two vehicles A and B is moving faster?



b. Which of the vehicle is moving with a constant speed?



a. A is faster , being higher slope

b. A is moving with a constant speed.

8. a. What are nanosecond and microsecond?

b. change 30 km / h into m/ s

a .1 microsecond = 10^{-6} sec.

1 nanosecond = 10^{-9} sec.

c. 30 km in 1 hour

30 x 1000 m in 1 x 60 x 60 seconds

$= \frac{30}{60} \times \frac{100}{60} = 8.33\ ms^{-1}$

9. a. What is called the bob of the pendulum?

b. A simple pendulum takes 35s to complete 20 oscillations. With is the time-period of the pendulum?

a. The metallic ball hanging by wire/ string is called bob.

b. Time to complete 20 oscillations = 35 x 5

Time to complete one oscillation = $\frac{35}{20}$

= 1.75sec.

One oscillation = time period = 1.75 sec.

10. A train is running at a speed of 45 km/ h. How long will it take to reach Lucknow from Delhi when the distance between two stations is 350 km/ h

Speed of train = 45 km/ h

Train to cover 45 km = 1 h

Train covers 350 km = $\frac{350}{45}$ = 7.77 hour

11. A postman takes 12 minutes to reach post office from his house by riding his bicycle. If he is running at the speed of 3 m/se, calculate the distance between his house and post office in km.

Time taken by postman = 12 minutes

Postman runs in one second = 3 m

Postman runs in 12 x 60 second = or 12 min

= 3x 12 x 60

= 2160 m

= 2.16 km

12. The odometer of a car reads 2552 km initially. It reaches its destination in 30 minutes which is 2584 km far . calculate the speed of the car in km/h.

Distance covered = 2584 – 2552 = 32 km

Time taken = 30 min = ½h

Speed = 32 x ½= 64 km/h

13. What are the limitations of a sundial?

There are two limitations of using sundial:

i. Sundials cannot be used after sunset or on a cloudy day.

ii. Sundials cannot be carried along to different places.

14. What is meant by slow and fast motion.

Slow and fast are relative terms. Slow motion of a body means speed is lower than the other body which is running fast.

II. Short Answer type question- II

1. Write three differences between speed and velocity.

Differences between speed and velocity:

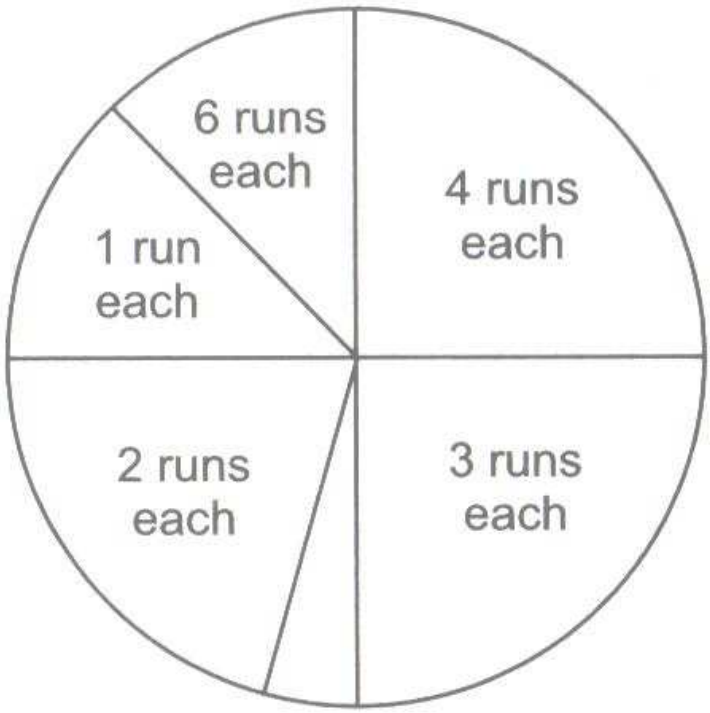
Speed	Velocity
1. It is the distance covered by a body per unit time in any direction. 2. It is a scalar quantity. 3.It is always positive or zero but never negative.	It is the distance travelled by a body in a given direction. It is a vector quantity. It may be positive or negative or zero.

2. Write three main difference between distance and displacement.

Differences between distance and displacement.

1. Distance is the length of the actual path covered by a body, irrespective of its direction of motion.	Displacement is the shortest distance between the initial and final positions of a body in a given direction.
2. Distance between two given point may be same or different for different paths chosen .	Displacement between two given points is always same.
3. it is scalar quantity,	Its vector quantity.
4. Distance covered is always positive or zero.	Displacement covered may be positive, negative or zero.

3. In a match, a team scored 200 runs, out of which they made tweleve four, three sixes, twenty times three runs, twenty times two runs and thirty four times one run. Show this by a pie chart. (Approx)



4. What were the definitions of a day, a month and a year for our ancestors?

Day Time between two sunrise.

Month : time between one new moon to the next.

Year : time take by earth to complete one revolution of the earth.

5. What is a pendulum? How can it be used to determine time?

Pendulum is a simple device which shows periodic motion. A simple pendulum consists of a non- magnetic metal ball called bob. This bob is suspended with the help of a string. The open end of the string is tied to a support . bob of the pendulum is held at a side and released. It starts moving in a to and fro motion. This is called an oscillatory motion. The time taken by the pendulum to domplete one oscillation is called time period. This time period is always same with a pendulum having same length of the string.

The string of the pendulum is adjusted to the length, that is completes one oscillation in second and it keeps on moving the clock giving us time. It has been found that pendulum of about 25 cm length takes exactly on second to complete one oscillation.

6. Describe various methods used to measure time in earlier days.

There were no electronic watches in earlier days. Sunset time was a little bit difficult proportion. The earliest method of measuring time was based on the position of the sun. the sundials were used for this purpose. Time was measured by the shadow cast by the changing position of the sun form day to night. Chine made a were clock 6000 years ago. Sand clock was also used to measure time . sand clock was used by Romans. The time taken by sand to fall into the lower chamber form the upper chamber was considered to be the unit of measuring time. The discovery of pendulum helped in determining the exact time before the electronic watches were invented.

7. Distance between bholu's and Golu's house is 9 km. Bholu has to attend Glu's birthday at 7' o Clock. He started from his home at 6 o 's clock on his bicycle and covered a distance at 6 km in 40 minutes. at that point he met chintu and he spoke to him for 5 minutes and reached Golu's birthday party at7'o clock. With what speed did he cover the second part of the journey? Calculate his average speed for the entire journey.

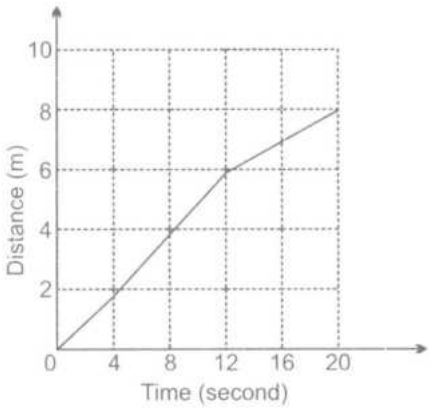
Bholu's covers 3 km in 15 min

Speed = $\frac{3}{15} \times 60$ 12 min $= \frac{1}{60}$ h 12km/n

Average speed = $\frac{Toatal\ distance\ travelled}{Total\ time\ taken}$

= $\frac{9}{1} = 9$ km/h

8. Given below is figure of the distance- time graph or the motion an object.



i. What will be the position of the object at 20s ?

ii. What will be the distance travelled by the object in 12 s?

iii. What is the average speed of the object?

i. From the graph, it is clear that the distance at 20s is 8m.

ii. Distance Travelled by the object in 12s is 6 m.

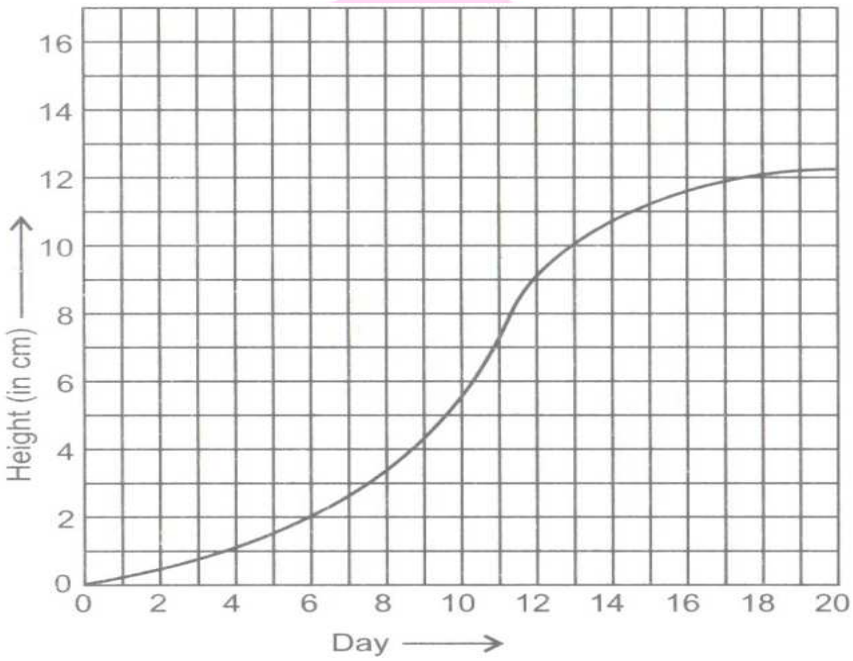
iii. Average speed $= \frac{Total\ distance}{Total\ time}$

$= \frac{8}{20}$

$= 0.4$ m/s.

I. Long Answer type question.

1. Aman made a graph to show the relationship between the speed of a car and time.



Look at the graph and answer the following questions:

i. What has Aman shown on each axis?

ii. What is the scale of the graph?

iii. What is the speed of the car at 3.30 minutes?

iv. What distance is covered by the car in 4 minutes?

v. At what time the car has assumed constant speed?

i. Time in minutes on x-axis and speed in m/min on y-axis.

ii. On X-axis, 10 divisions = 1 min and on y-axis 10 divisions = 25 m/min

iii. At 3.030 minutes, the speed of car is 30 m/min.

iv. Distance at 4 min = Speed x time

= 52.5 x 4 = 210.0 m.

v. After 6.30 minutes the car has assumed constant speed.

2. i. How can we choose a suitable scaled to draw a distance- time graph? Explain by giving example.

ii. which are the uses of distance- time graph?

i. We should keep the following points in mind while choosing the most suitable scale for drawing a graph :

a. The difference between the highest and lowest values of each quantity.

b. The intermediate values of each quantity, so that with the scale chosen, it is convenient to mark the values on the graph.

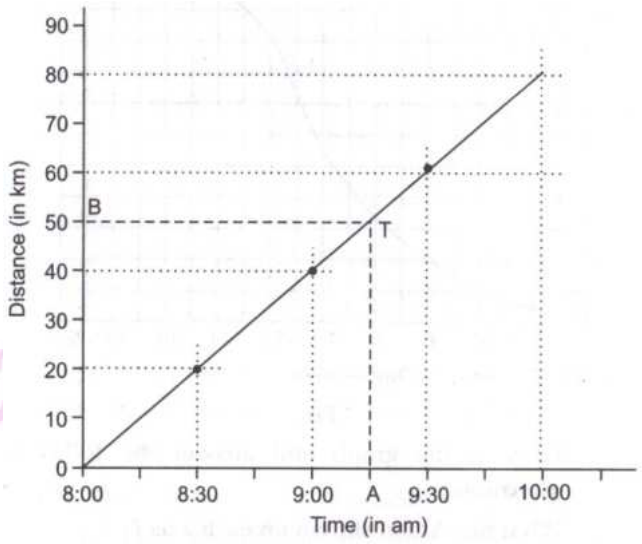
c. To utilize the maximum part of the paper on which the graph is to be drawn. Suppose that we have a graph paper of size 25 cm x 25 cm and we have to accommodate following data.

Time (a.m)	Odometer reading	Distance from the starting point
8:00 a.m	36540 km	0 km
8:30 a.m	36560 km	20 km
9:00 a.m	36580 km	40 km
9:30 a.m	3600 km	60 km
10:00 a.m	36620 km	80 km

One of the scales will be;

Distance : 5 km = 1 cm and

Time : 6 min = 1 cm



ii. Importance of distance-time graph : From the graph, we can find the distance moved by the bus at any instant of time, not given in the table. For example, we want to know the distance covered. Up to 9.15 a.m on the x-axis. Let it be A. Next draw a line perpendicular to x-axis at A. Let it intersects the distance time graph line at T. Next draw a line through T parallel to x-axis. Let it intersects the y-axis at B. The distance corresponding to point B on the Y-axis gives the distance covered by the car up to 9.15 a.m this is 48 km.

3. Describe steps to construct a graph using the data given in the following table.

S. No	Time (minutes)	Distance (km)
1.	0	0
2.	5	606
3.	15	20
4.	30	40
5.	45	60
6.	60	80

The following steps may be followed:

i. Draw two perpendicular line to represent the two axis and mark them OX AND OY. O is the intersection of the two axis.

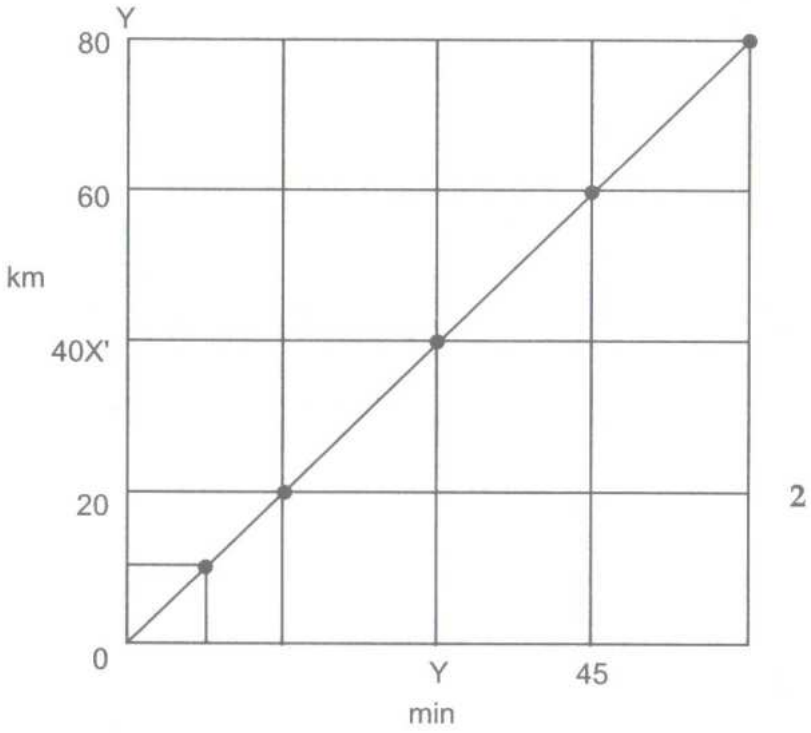
ii. Decide the quantity to be shown along the y-axis. From the given date, we are measuring distance at given intervals of time. So time it to be shown along x-axis distance along y-axis.

iii. Choose a scale to represent the given data. Suppose we have 4 (or 40 divisions along y-axis. Along x-axis and 4 squares (or 40 divisions along y-axis. Along x-axis we can take 10 divisions equal to 15 min and along y-axis we can take 10 divisions equal to 20 km.

iv. Mark the values of time and distance on the respective axis.

v. Now mark points on the graph paper to represent each set of values for distance and time.

vi. Join all points on the graph. Graph obtained is shown below.



4. a. Define speed.

b. The distance between Delhi and Agra is 270 km. A train takes 3 hours to cover the distance. calculate the speed of train.

c. Show the shape of distance- time graph for vehicle moving with a constant speed.

a. The total distance covered in given interval of time is known as speed.

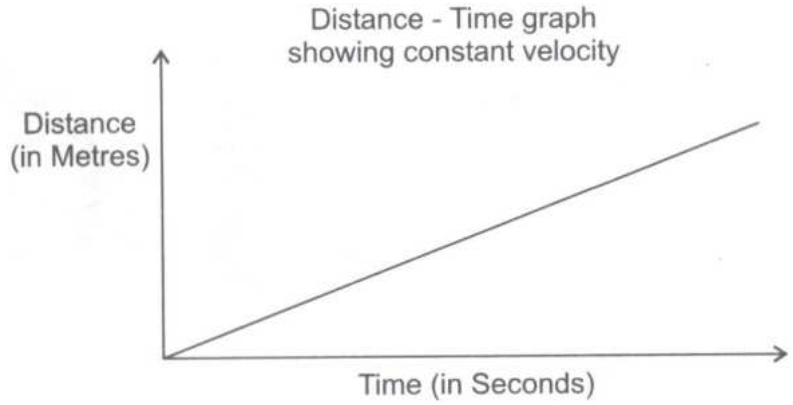
b. Distance between Delhi & Agra = 270 km

Time taken by train = 3 hours

Sped = Distance / time

= 270/ 3 = 90 km/ hr.

c. Distance – Time graph



II. Long Answer type question.

1. Complete the following table :

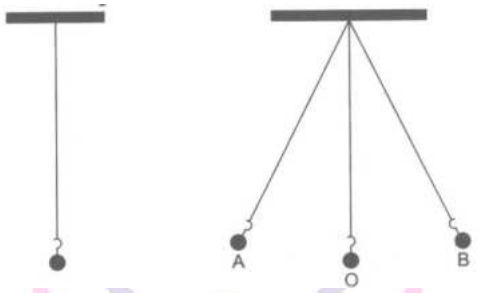
Table 13.3Som examples of different types of motion

Examples of motion	Types of motion along a straight line / circular / periodic
Soldiers in a march past Bullock cart moving on a straight road hands of an athlete in a race Pedal of a bicycle in motion Motion of the earth around the sun Motion of a swing Motion of a pendulum	

Examples of motion	Types of motion along a straight line / circular / periodic
oldiers in a march past	Straight line
Bullock cart moving on a straight road	Straight line
Hands of an athlete in a race	Periodic
Pedal of a bicycle in motion	Circular
Motion of the earth around the sun	Circular and Periodic
Motion of a swing	Periodic
Motion of a pendulum	Periodic

2. What is a simple pendulum? Explain how does it perform oscillatory motion.

A Simple pendulum consists of a small metallic ball or a piece of stone suspended from a rigid stand by a thread. The metallic ball is called ob of the pendulum.



When the bob of the pendulum is released after taking it slightly one side, it starts to move to and fro. The to and fro motion of a simple pendulum is an example of an oscillatory motion.

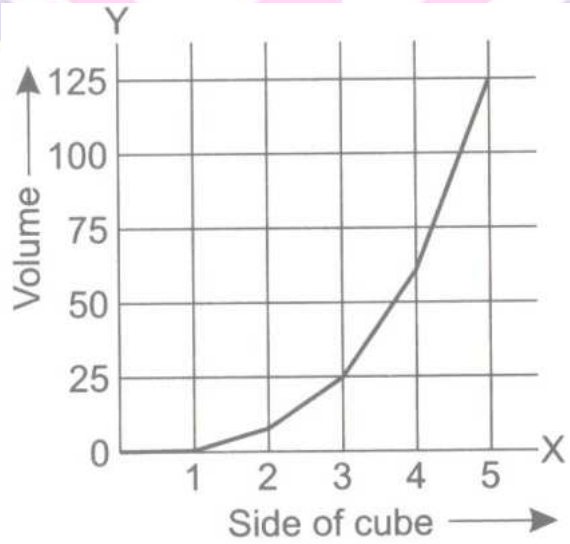
3. Look at the graph and answer the following question:

i) What is shown on each axis?

ii) What is the scale?

iii) What is the volume of the cube whose side is 4cm?

iv) Can you find the volume of a cube or side 6 cm by extending graph?



i) Side of a cube is shown on x-axis and the volume on y – axis

ii) Scale on x-axis 1 unit = 1 cm Y axis [Unit = 25cm^3

iii) The volume of the cube whose side is 4 cm = 64cm^3

iv) Yes, we can find out the volume.

4. Describe the steps to construct a graph with the help of following data

Table 13.4: The motion of a car

S. No.	Time	Distance
1	0	0
2	1 min	1 km
3	2 min	2 km
4	3 min	3 km
5	4 min	4 km
6.	5 min	5 km

We can make the graph by using following steps:

i) Draw two perpendicular lines to represent the two axes and mark them as OX and OY

ii) Decide the quantity to show along the x and y-axis. In this case we show time along the x-axis and the distance along the y-axis.

iii) Choose a scale to represent the distance and time on y-axis and x-axis respectively.

iv) Mark the value of time and distance on the respective axes according to the scale chosen.

v) Now mark the points on the graph. This is the distance-time graph for the motion of the car.

vi. Join all the points on the graph. This is the distance-time graph for the motion of the car.

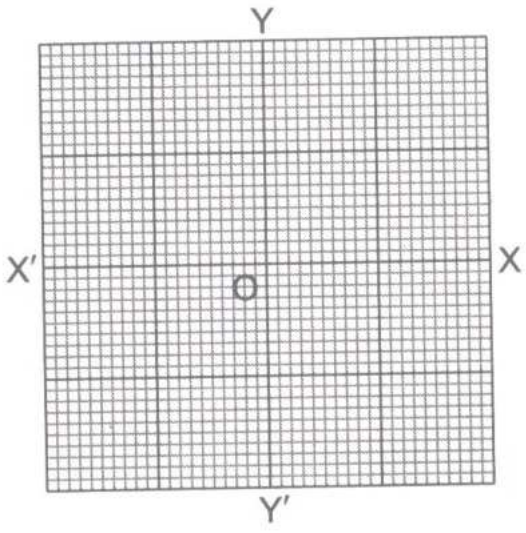
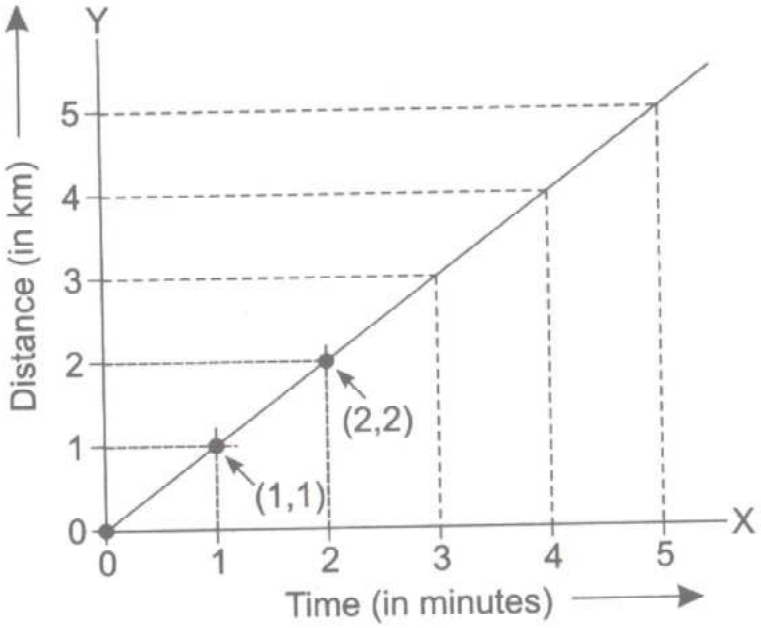


Fig. 13.17 *x*-axis and *y*-axis on a graph paper.



5. Write importance of distance –time graph

i) Distance – time graph provides a variety of information about motion

ii) We can find the distance moved any the body at any instant of time

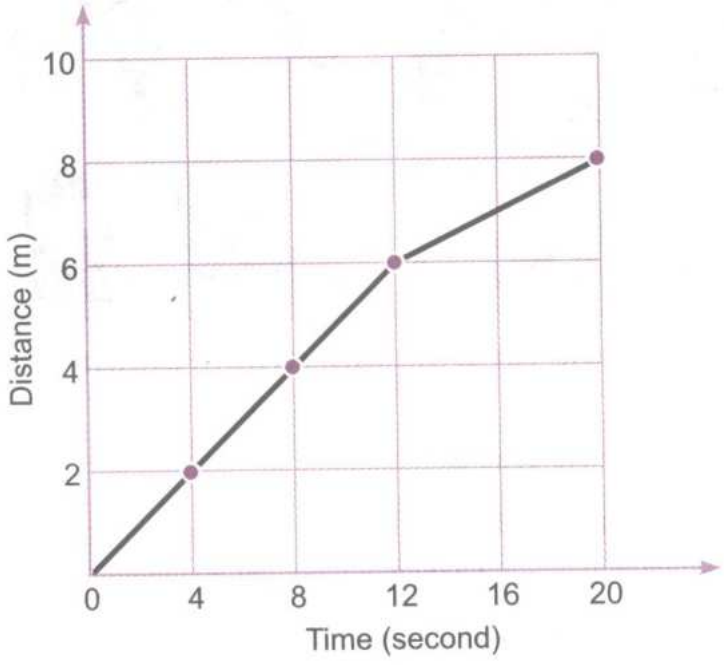
iii) It shows whether motion is uniform or non-uniform

iv) It tells us that motion is accelerated or retarded.

III. Long Answer type question.

1. Given below as figure is the distance- time graph of a motion of an object.

(NCERT Exemplar)



a. What will be the position of the object at 20 s?

b. What will be the distance travelled by the object in 12 s?

c. What is the average speed of the object?

a. 8 m from the starting point.

b. 6 m

c. Average speed $= \frac{Total\ distance\ travelled}{Total\ time\ taken}$

$= \frac{8m}{20s} = 0.4\ m/s$

2. The odometer of a car reads 57321.0 km when the clock shows the time 08.30 a.m. What is the distance moved by the car, if at 8.50 a.m., the odometer reading has changed to 57336.0 km? Calculate the speed of the car in km/min during this time. Express the speed in km/h also. (NCERT)

Initial reading of the odometer of the car = 57321.0 km

Final reading of the odometer of the car = 57336.0 km

Distance covered by the car = Final reading of the odometer of the car – Initial reading of the odometer of the car = 57336.0 – 57321.0 = 15 km

The given car starts at 8.30 a.m. and stops at 8.50 am

Therefore, time taken by the car to cover the distance is (8.50 – 830) min = 20 min

Distance covered by the car = 15 km

Time taken by the car = 20 min

Speed $= \frac{Distance\ covered}{Time\ taken}$

$= \frac{15}{20} = 0.75\ km/min$

Again, 60 min = 1 h

20 min $= \frac{1}{60}\ x\ 20 = \frac{1}{3}h$

Time taken by the car $= \frac{1}{3}h$

Speed $= \frac{Distance\ covered}{Time\ taken}$

$= \frac{15}{1/3} = 45\ km/h$

3. With the help of an activity, explain how will you measure the time period of a simple pendulum.

Activity:

- Suspended a metallic ball (bob) by a long thread from a rigid support. Your simple pendulum is ready.

- Set the simple pendulum in motion.
- Note the time in your watch when bob is at an extreme position (say A).
- When the bob again comes to the position A, count 1 (one). Each time the bob reaches this position (A), increase the count by 1 (one).
- Check the time after 25 such oscillations. Find the time taken in 25 oscillations.

I. High order thinking Skills (Hots) Question.

1. A stone is dropped from the a height of 20 m above the ground. Will it have a uniform or non- uniform speed, as it moves towards the gorund?

A free falling body moves with constant speed, .e., speed of earth gravity. Thus, the stone will have a uniform motion.

I. Value Based Question

1. Two railway station are 320 km apart from each other. Train- I covers this distance in 4.5 hours whereas train – II reaches the destination 10 minutes earlier.

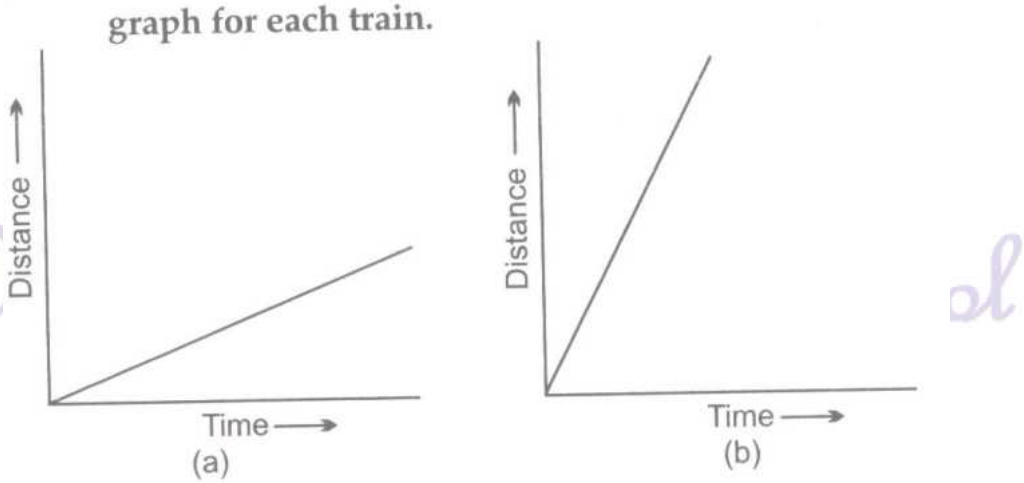
Based on this information answer the following questions:

i. What might be the reason that the train –II reaches the destination earlier?

ii. Calculate the speed of both the trains.

iii. if we consider that both the trains move with constant speed, then assign one distance-time constant speed, then assign one distance – time graph for each train.

graph for each train.



i. Train – I I might have gone in higher speed then the train – I as it takes less time to cover the same distance.

ii. For train – I

Distance = 320 km

Time Taken = 4 h 30 mins

$= 4\frac{1}{2}$ h

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

$= \frac{320}{9/2}$ km/ h

$= \frac{320 \times 2}{9} = \frac{640}{9}$

= 71.1 km/ h

For train – I I

Distance =320km

time taken = 30mins less than the first train

$= 4h$

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

$= \frac{320}{4}\ km/h$

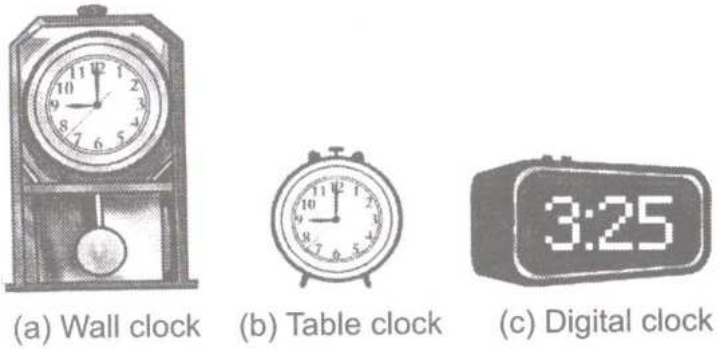
$= 80\ km/h$

iii. The graph in figure (a) is of train – I

The graph in figure (b) is of train – I I.

Skill Based Questions.

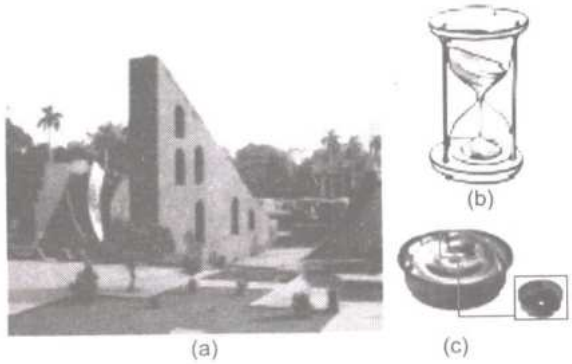
1. Draw a diagram of (a) wall clock (b) table clock (c) digital clock. On what principle do all clocks work?



(a) Wall clock (b) Table clock (c) Digital clock

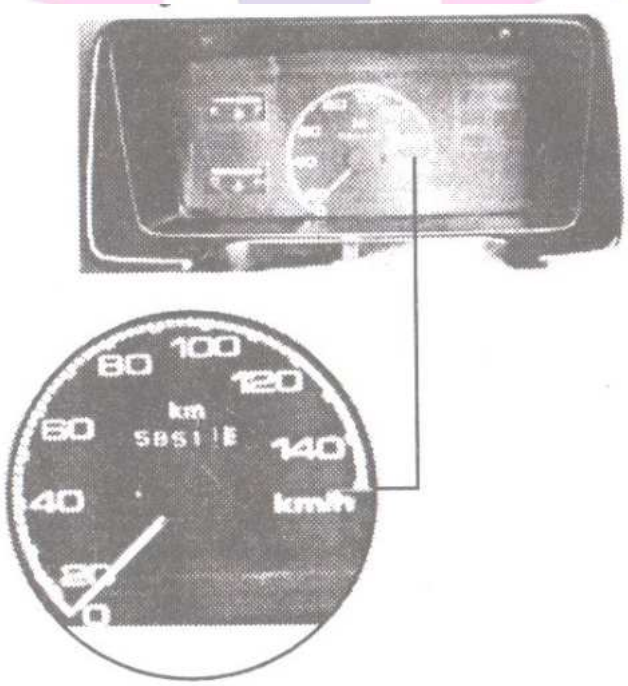
All of these clocks work on the principle of periodic motion

2. Observe the following figures and identify them



a) Sundial at Jantar Mantar, Delhi b) Sandal clock c) Water clock

3. a) observe the following figure and identify it.



b) Write the functions of them

a) This figure shows the dashboard of a car. It consist of two types of meter

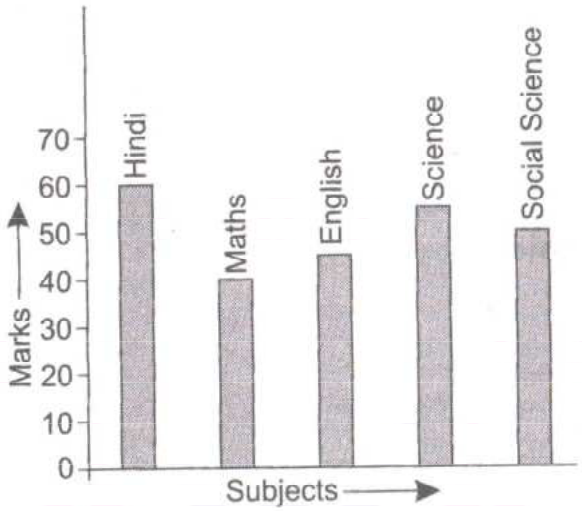
i) Speedometer ii) Odometer

b) In function of speedometer is to measure the speed of the vehicle directly in km/h. The odometer is used to measure the total distance moved by the vehicle

4. Draw a Bar Graph by the following data of marks got by a student in different subjects.

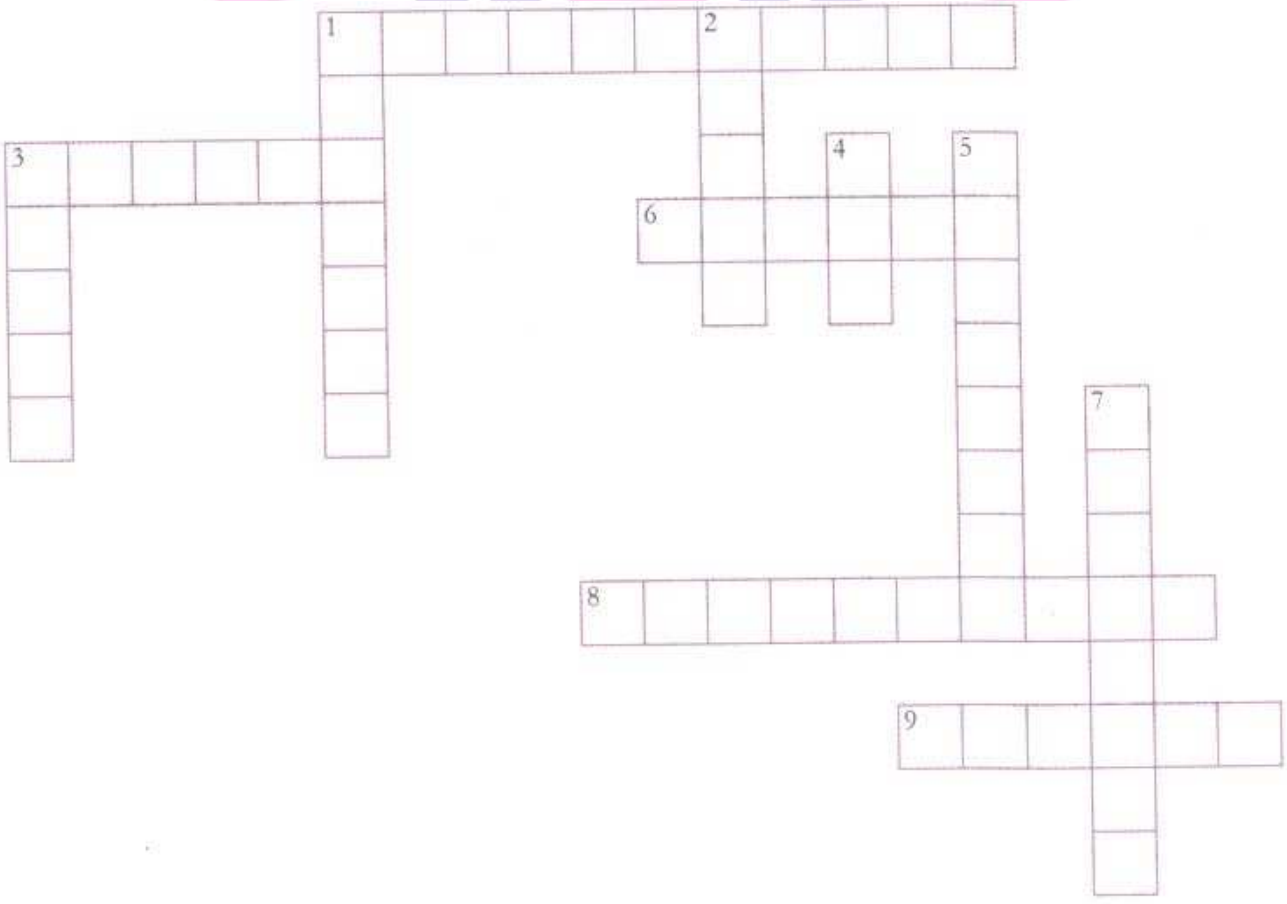
1. Hindi – 60 2. Maths -40 3. English – 45

4. Science – 55 5. Social science - 50



Cross word Puzzle

1.



Across

1. An instrument on a motor vehicle, etc. indicating its speed.

3. It is a Greek word meaning indicator.

6. The SI unit of time.

8. Time taken by a pendulum to complete one oscillation.

9. A substance whose crystals can vibrate very fast and at a very precise rate.

Down

1. An instrument showing the time by the shadow of a pointer cast by the sun onto a graduated plate.
2. The SI unit of length.
3. A diagram showing the relation between two variable quantities, each measured along one of a pair of axes.
4. The metallic ball used in a pendulum.
5. An instrument that measures the distance moved by the vehicle.
7. The Si unit of mass

Across

1. speedometer
3. gnomon
6. second
8. timeperiod
9. quartz

Down

1. sundial
2. meter
3. graph
4. bob
5. odometer
7. kilogram