Motion and Time Class 7

Distance-Time Graph

- Setup
  - X-axis: time: Time goes side to side.
  - Y-axis: distance: Distance goes up and down.
- Making it
  - Pick scale: Decide cm for time and distance.
  - Plot points, connect: Mark spots and draw line.
- Meaning
  - Straight line: steady speed: No change in pace.
  - Curved: changing speed: Speed goes up or down.
- Using it
  - Find distance at time: Check where line hits at a time.
  - Calculate speed: Slope shows how fast.
- Scale tips
  - Fit paper, easy values: Make graph clear and simple.

Slow or Fast

- Comparing fast and slow movement
  - Vehicles moving same way: Easy to see which is faster on a road.
  - Distance in set time: Bus goes farther than bike in one hour.
- Speed and time relation
  - Faster means less time: Quickest racer finishes first.
- Meaning of speed
  - Distance per time unit: How far something goes in one second.
- Average speed
  - Total distance ÷ total time: 50 km in 1 hour = 50 km/h.
- Types of motion
  - Uniform: steady speed: Moving same pace all the time.
  - Non-uniform: changing speed: Speeding up or slowing down.

Measuring Speed

- Meaning
  - Distance per time: How much moved in one unit.
- Formula
  - Distance ÷ Time: Speed
- Units
  - m/s, km/h: units ofSpeed
- Tools
  - Speedometer: shows speed: Tells speed right away.
  - Odometer: shows distance: Counts total kilometers.
- Ways to measure
  - Direct: distance and time: Use a ruler and watch.
  - Graphs: distance-time: Draw to see speed pattern.

Speed

- What is speed
  - Distance in unit time: Measures how fast something travels.
- How to calculate
  - Formula: Distance ÷ Time: Simple way to find speed.
- Units
  - Meter per second (m/s): Basic speed unit in science.
  - Kilometer per hour (km/h): Common for cars and bikes.
- Average speed
  - Not always steady: Can vary during a trip.
- Motion types
  - Uniform: constant: Straight line, same speed.
  - Non-uniform: varies: Speed changes over time.
- Measuring speed
  - Speedometer for vehicles: Shows speed on a dashboard.

Units of Time and Speed

- Time units
  - Second (s): Base unit for all time.
  - Minute (min): 60 seconds make one minute.
  - Hour (h): 60 minutes make one hour.
- Speed units
  - Meter per second (m/s): Speed in small steps.
  - Kilometer per hour (km/h): Speed for long trips.
- Notes
  - Singular symbols (e.g., 50 km): No "s" in unit names.

Measurement of Time

- Old ways
  - Nature cycles (day, month, year): Sunrise to sunrise is one day.
- Tools
  - Clocks and watches: Everyday timekeepers.
  - Pendulum: steady swing: Swings same time each go.
- Units
  - Second (s): Smallest common time unit.
  - Minute (min), Hour (h): Bigger units for longer times.
- Accuracy
  - Basic: 1 second: Regular clocks stop here.
  - Modern: microseconds, nanoseconds: Tiny time bits for tech.
- History
  - Sundials, water clocks: Old tools using sun or water.
- Today
  - Quartz clocks: Electric and very exact.
  - Super accurate clocks: Wrong by 1 second in millions of years.

Presented with xmind

TOPIC: MOTION AND TIME

I. OBJECTIVE-TYPE QUESTIONS

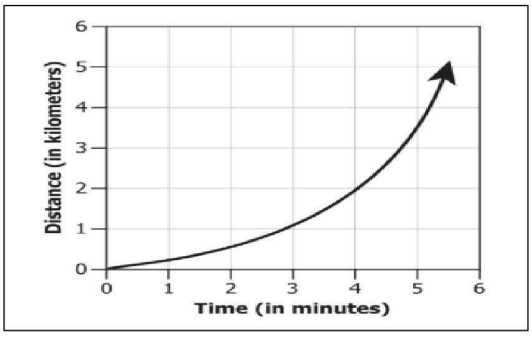
1) Which among the following is an **incorrect** statement?
   a) Increase or decrease in the length of the string will increase or decrease the time period respectively.
   b) The metallic bob is free to swing on the rigid stand.
   c) The pendulum is at rest in its extreme position.
   d) The pendulum of a given length takes always the same time to complete one oscillation.

2) The simple pendulum is an example of :
   a) Periodic motion
   b) Oscillatory motion
   c) Circular
   d) Both a and b

3) Time period is :
   a) Total time taken/No: of oscillations
   b) No: of oscillations/Time taken
   c) Distance/Time
   d) Distance/No: of oscillations

4) One oscillation is completed when the bob of the pendulum moves from
   a) One extreme to the other
   b) One extreme to the other and back to first extreme position
   c) The mean position to one extreme and the other extreme.
   d) The extreme to its mean position

5) The graph represents the time taken by a car to cover a certain distance.



Which of these statements is true for the speed of the vehicle?

a)It has a uniform speed as time and distance both are increasing

b)It has a uniform speed as the speed of the vehicle keeps on changing

c)It has a non-uniform speed as time and distance both are decreasing

d)It has a non-uniform speed as the speed of the vehicle keeps on changing

6. Which of these motions explains a periodic motion?

a)That follows a curve path

b)That occurs in a straight path

c)That is associated with calculating time

d)That repeats in an equal interval of time

For the following questions, two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (i), (ii), (iii), and (iv) as given below

(i) Both A and R are true and R is the correct explanation of the assertion.
(ii) Both A and R are true but R is not the correct explanation of the assertion.
(iii)A is true but R is false.
(iv) A is false but R is true.

7. **Assertion (A):** When a pendulum moves to and fro from its fixed position it is said to complete one oscillation.
Reason (R): Time period is the time taken by a pendulum to complete one oscillation.
Ans (ii) Both A and R are true but R is not the correct explanation of the assertion.

8. **Assertion (A):** The revolution of the earth around the sun is a periodic motion.
Reason (R): The type of motion where an object repeats its motion after equal intervals of time is called periodic motion.
Ans. (i) Both A and R are true and R is the correct explanation of the assertion.

9. **Assertion (A):** A faster-moving object covers more distance in less time.
Reason (R): The speed of a faster-moving object is less.
Ans. (iii) A is true but R is false.

10. **Assertion (A):** The speedometer records the speed of the vehicle generally in km/h.
Reason (R): Odometer measures the distance moved by the vehicle in one hour.
Ans. (iii) A is true but R is false.

II. VERY SHORT QUESTIONS (2M):

1. a) What do you mean by the average speed of an object? How can you find it?
[Hint-The average speed of an object is the total distance travelled by the object divided by the total time taken to cover that distance.
Average speed = Total distance covered/Total time taken]

b) A car covers 20 km in the 1st hour of its journey, 40 km in the next hour and 30 km in 3rd hour. Calculate the average speed.

[Hint: Average speed = Total distance covered/Total time taken
= 90/3 = 30 km/h]

2. What devices are used in vehicles to record speed and distance?

[Hint: The speedometer is used to record the speed of the vehicle in km/h and the odometer is used to record the distance covered in km.]

3.a) Define motion.

[Hint: A body is said to be in motion if it changes its position with respect to its surroundings in a given time.]

b)What do you mean by an oscillatory motion? Give an example.

[Hint: The to and fro motion of a body about its fixed position is called an oscillatory motion. Example - Motion of a simple pendulum.]

c) Classify the following as rectilinear, circular or oscillatory motion.

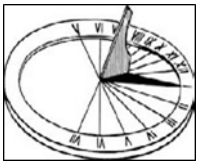
i.Motion of a child in a merry-go-round. ii. Bullock cart moving on a straight road.

[Hint: i. Motion of a child in a merry-go-round-circular motion.
ii. Bullock cart moving on the straight road- rectilinear motion.]

4. What are quartz clocks? Write its advantage.

[Hint- A quartz clock is a special type of clock or watch which uses the vibration of a quartz crystal and has an electric circuit with one or more cells. It gives more accurate time.]

5. a)Identify the time-measuring device given below. What was the principle behind working of the device?



[Hint: The given time measuring device is a sundial. It works on the principle that as the position of the sun in the sky changes, the position and length of the shadow cast by the object changes.]

b) Name any two time-measuring devices used in ancient times.

[Hint: Sundial and Sand clock.]

6. a) A simple pendulum takes 35s to complete 20 oscillations. What is the time period of the pendulum?

[Hint-Time period=Total time taken/No: of oscillations
35/20 = 1.75s]

b) What is meant by the time period of a simple pendulum?

[Hint: The time taken by the pendulum to complete one oscillation is called its time period.]

7. a) Define speed. What is its basic unit?

[Hint: The distance covered by an object in unit time is called speed.
Its basic unit is metres per second (m/s).]

b) Write the formula for calculating speed.

[Hint- Speed = Distance/Time]

c)Mention the standard units of distance and time.

[Hint-metre (m) and second (s)]

d) How can we say that the speed of an object is faster than the other?

[Hint: An object can be said to have a faster speed if it covers a longer distance than the other, during a given period of time.]

III. SHORT ANSWER TYPE QUESTIONS: (3M)

1. Distinguish between uniform and non-uniform motion with examples.

   [Hint-If a body covers equal distances in equal intervals of time, then the motion is said to be uniform. Example-Hands of a clock. If a body covers unequal distances in equal intervals of time, then its motion is called non-uniform motion. Example -Motion of a car in city traffic]

2. a)Draw a neat diagram of a simple pendulum showing its mean and extreme positions.

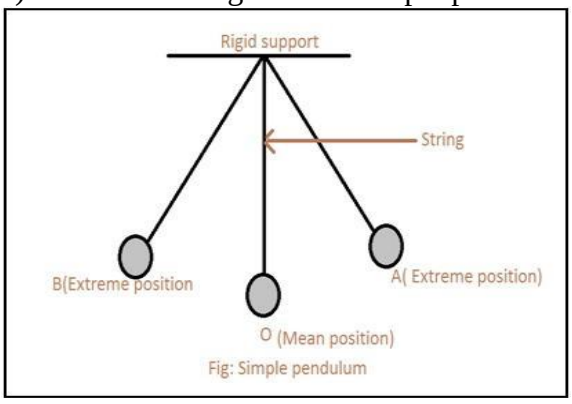


Fig: Simple pendulum

   b) What is called the bob of the pendulum?

   [Hint: The metallic ball of a simple pendulum suspended from a rigid stand by a thread.]

3. Differentiate circular and rotational motion with examples.

   [Hint: A type of motion in which objects move along a circular path is known as circulatory motion. Example-Movement of the earth around the sun. The type of circular motion where an object spins on its own axis is called rotational motion. Example - Rotation of earth on its axis.]

4. Write down the definitions for a day, a month and a year in the ancient period.

   [Hint: Day – Time between two sunrises. Month - The time interval between one new moon and the next. Year - Time taken by the earth to complete one revolution around the sun.]

5. a) 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 the two stations is 315 km?

   [Hint: Speed of the train = 45 km/h.
   Distance to be covered = 315 km.
   Time taken = Distance/Speed
   = 315/45 = 7 h]

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

   Ans. Distance between two stations = 240 km
   Time taken to cover these distance = 4 hours

Speed = Distance/Time
= 240 / 4
= 60 km/h

6. A bus travels a distance of 480 km in 8 hours and a train covers a distance of 1200 km in 10 hours. Which one of the two travels faster- a car or a train?
[Hint: Speed of the bus = 480/8 = 60 km/h.
Speed of the train = 1200/10 = 120 km/h.
The speed of the car is 60km/h whereas the speed of the train is 120km/h. So, the train travels faster.]
7. a)A spaceship travels 36,000 km in one hour. Express its speed in m/s.
[Hint: 36,000 x 5/18 = 10,000 m/s.]
b) A rocket travels at a speed of 15,000 m/s. Express this speed in km/h.

Ans. Speed of rocket in m/s = 15,000
Speed of rocket in km/h = 15,000 x 18/5
= 3,000 x 18
= 54,000 km/h

c) A train moves at a speed of 162 km/h. Express this speed in m/s.

Ans. Speed of train in km/h = 162
Speed of train in m/s = 162 x 5/18
= 9 x 5
= 45 m/s

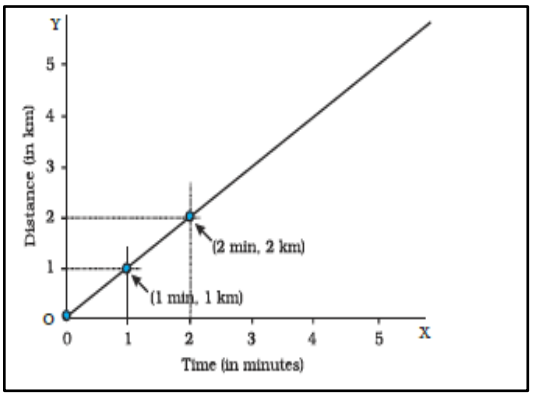
8. A truck moves at the speed of 25 km/h for 10 hours. Calculate the distance covered.
[Hint: Speed of the truck = 25 km/h.
Time taken = 10 h.
Distance covered = Speed x Time
= 25 x 10 = 250 km.]

IV. LONG ANSWER TYPE QUESTIONS. (5M)

1. Explain different types of motion with examples.
[Hint: i) The type of motion in which objects move along a straight line is known as rectilinear motion. Example- Soldiers in a march past.
ii)The type of motion in which objects move along a circular path is known as circular motion. Example- Pedal of a bicycle in motion.
iii)The type of circular motion where an object spins on its own axis is called rotational motion. Example- Rotation of earth on its axis.
iv)The type of motion where the object repeats its motion after a fixed interval of time is called periodic motion. Example- Revolution of the moon around the earth.
v) The to and fro motion of the body about its fixed position is called oscillatory motion. Example – Pendulum of a clock.]

2. Describe the steps in constructing a Distance-Time graph.

Scale-
X axis- 1min=1cm
Y axis- 1km=1cm



[Hint-A distance-Time graph is usually drawn as a line graph as it takes two variable quantities – distance and time. In a distance-time graph, distance is taken on the Y-axis (vertical) and time is taken on the X-axis (horizontal).

i)Draw two perpendicular lines on a graph paper representing the X-axis and the Y-axis.

ii)The point of intersection of both axes is known as the point of origin.

iii) Put time on the X-axis and distance on the Y-axis.

iv)Select suitable scales to represent the required quantities on both axis.

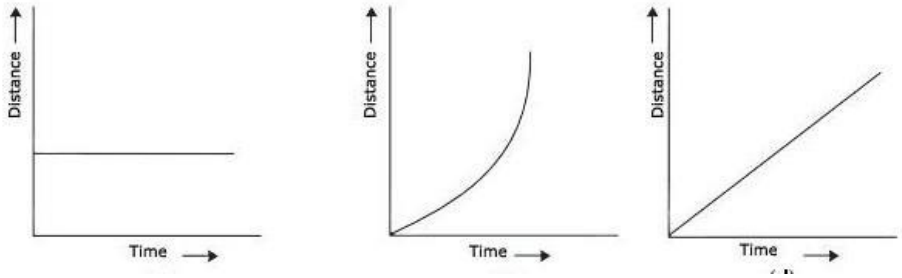
v)Plot points corresponding to each value on both the axes for time and distance covered.

vi)Join all the points to obtain a line graph.]

b) Mention any two types of graphical representation of information.

[Hint: Pie chart and line graph.]

3. a. What is the advantage of the distance-time graph?
   b. What do the following graphs indicate?



a)[Hint: Distance-time graphs give information about the nature of the motion of an object like uniform or uniform motion. Motion of an object can be represented by its distance-time graphs.]

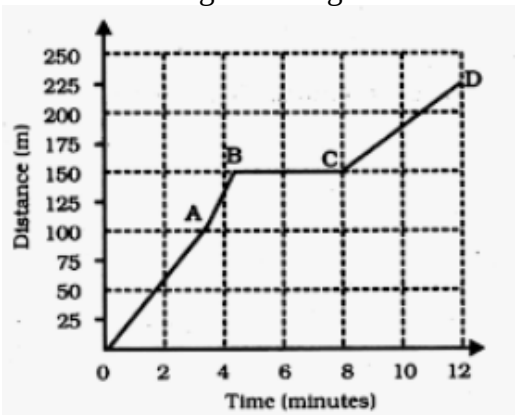
b. [Hint: i) If the distance-time graph of an object is a horizontal line parallel to the time-axis, then the speed of an object is zero. The object is not moving. It is stationary. The object is at rest.

ii) If the distance-time graph of an object is not a straight line (curved line), then its

speed is not constant. The speed is changing. The object is in non-uniform motion.
iii)If the distance-time graph of an object is a straight line, then it is moving with constant speed and the object is in uniform motion.]

V. SOURCE-BASED/ CASE STUDY-BASED QUESTIONS

1. Boojho goes to the ground to play football. The distance-time graph of his journey from his home to the ground is given below in a graph.



   (a) What does the graph between points B and C indicate about the motion of Boojho?
   [Hint: Boojho is at rest; his speed is zero.]
   (b) Is the motion between 0 to 4 minutes uniform or non-uniform?
   [Hint: Motion between time 0 to 4 min is non-uniform.]
   (c) What is his speed between 8 and 12 minutes of his journey?
   [Hint: Speed = Distance/Time = 75/4 = 18.75 m/min.]

2. While going for a school picnic, Paheli decided to note the reading on the meters on the dashboard of the bus every 30 minutes till the end of the journey. The speedometer recorded the speed directly. The odometer reads 2552 km initially. After 30 minutes the odometer reads 2574 km. On reaching the destination after one hour, the odometer reads 2605 km.
   (a) What is an odometer?
   [Hint: Odometer is the device used to measure distance moved by the vehicle.]
   (b) Find the distance covered by the bus in the first 30 minutes.
   [Hint: 2574 – 2552 = 22 km]
   (c) What is the unit by which the speedometer records speed?
   [Hint: km/h]
