

NOTES

CLASS 6

SCIENCE

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MOTION AND MEASUREMENT OF DISTANCES

With the changing times, transport also has gone through various modifications i.e. from animals to the invention of wheels. The evolution of transport is evident when we observe the fast cars, bullet trains etc. Even today new modes of transport are being researched upon.

- **Distance:** How far an object travels constitutes distance!! The GPS system introduced these days accurately measures the distance from one place to another.
- Arbitrary ways to measure the length or width:
 - Measuring using handspan and measurement by a string were used in ancient times but these methods are not so reliable and hence some standard units of measurement have been introduced.



The Hand span Method

Standard Units of Measurement

Earlier the ‘cubit’ was accepted as a standard unit in Egypt. A cubit meant the length between fingertips and elbow. Owing to the differences in the length of body parts of

each person these arbitrary systems became obsolete. Other units used earlier were ‘foot’, end of outstretched arm and chin, fist, etc.

Nowadays, the International System of units or the SI units have been accepted all over the world as a standard unit of measurement.

$$1 \text{ m} = 100 \text{ cm}$$

$$1 \text{ kg} = 1000 \text{ g}$$

$$1 \text{ s} = 1/60 \text{ min}$$

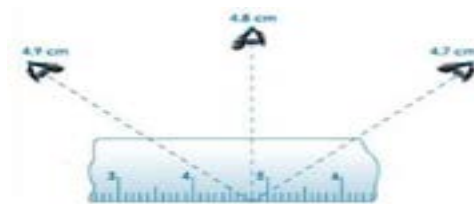
The MKS system i.e. the metre-kilogram-second system is called the **SI System**.

Correct Way to Use a Meter Scale

Step 1: Keep the scale in contact with the object to be measured.

Step 2: Start measuring from the 0 mark of the scale.

Step 3: To avoid taking incorrect measurements the eye position should be correct. Consider the following figure:



The eye position in the centre is correct to get an accurate measurement, while the ones in the left and right direction will give some error in measurement.

Measurement along Curved Line

Is it possible to measure a curved line with a metre scale? Well, it is not so. Hence to measure a curved line the following steps can be taken into account:

- Take a thread and tie a knot at one end.
- From this end measure a small portion of the curved line which is somewhat straight and put the thumb.
- Now again start from the thumb marked position and measure another small portion of the line.
- Repeat this process until you reach the end of the line. Tie a knot on the thread on reaching the end. Now measure the two knots using a metre scale.

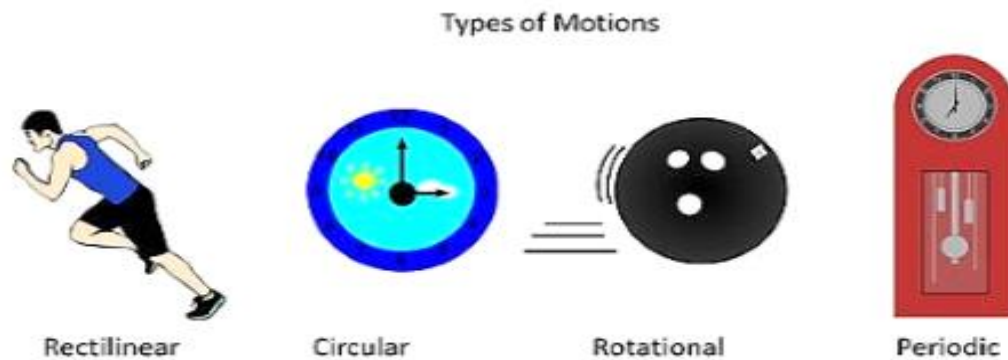


Measuring a Curved Line



Types of Motion

- **Rectilinear Motion:** When an object moves along a straight line, it is said to be undergoing rectilinear motion. **For Example,** A train moving along a railway track.
- **Circular Motion:** Have you seen the hands of a clock? The motion exhibited by the hands of a clock is called **Circular Motion**.
- **Periodic Motion:** When an object repeats its motion after a fixed interval of time it is said to be undergoing periodic motion. **For Example,** Pendulum
- **Rotational Motion:** This motion can be easily understood by imagining Earth's rotation. When the Earth spins on its own axis it is said to be undergoing rotational motion.
- Motion is defined as the change in position of an object.



Shows the examples of types of motion

SOMET IMPORTANT QUESTIONS

1. Define measurement.

Answer: It is the comparison of an unknown quantity with some known quantity of the same kind.

2. Define metre.

Answer: Metre is the standard unit for measuring length.

3. If you are sitting in a moving car, are you at rest or in motion? Explain.

Answer: You are at rest because you are not moving with respect to the car.

4. Which invention lead to the development of railroads?

Ans. Steam engine.

5. Write one multiple and submultiple units of lengths.

Answer: One multiple unit of length is kilometre (km). One submultiple unit of length is centimetre (cm).

6. What is the full form of S.I. unit.

Answer: International system of units.



7. Are senses reliable for accurate measurement?

Answer: Our senses are not reliable for accurate measurement.

8. Why can hand span and arm length not be used as standard units of length?

Answer: because these vary from person to person.

9. How many centimetres are there in 1 m?

Answer: 100 cm.

10. Name the measuring device which can be used for measuring the girth of a tree.

Answer: Measuring tape.

11. Give one example of linear motion.

Answer: Motion of stone falling from a certain height.

12. Give an example of circular motion.

Answer: Motion of arms of watch.

13. Name the types of motion in which a body moves along a straight path

Answer: Rectilinear or linear motion.

14. Give the unit for measuring the following:

(a) Distance between Delhi and Jaipur.

(b) Thickness of a coin.

(c) Length of your eraser.

(d) Length of your shoe lace.

Answer:

(a) Kilometre

(b) Millimetre

(c) Centimetre

(d) Centimetre

15. Name the device used to measure the following:

(a) Size of your shoulder.

(b) Size of your wrist.

(c) Your height.

(d) Your weight.

(e) Cloth for curtain.

(f) Circumference of round table.

Answer:

(a) Measuring tape

(b) Measuring tape

(c) Measuring tape

(d) Weighing balance

(e) Metre scale or measuring tape

(f) A long thread or measuring tape.



Short Questions and Answers

1: What is rectilinear motion? Give an example.

Answer: When objects move along a straight line such motion is called rectilinear motion. A sprinter in 100m race move along a straight track. This is an example of rectilinear motion.

2: Why can't we use an angul (finger) or mutthi (fist) as standard unit of measurement of length?

Answer: We cannot use an angul (finger) or mutthi (fist) as standard unit of measurement of length because the sizes of body parts of different people are different. So it can create confusion.

3: What is the system of unit of measurement used all over the world now? What is that for length?

Answer: International system of units (SI Units) is the system of unit of measurement used all over the world now. SI unit for length is metre.

4: The height of a girl is 1.50 m. Express it into cm and mm.

Answer: The height of a girl in cm is 150 cm and in mm is 1500 mm.

5: What is the difference between motion of ceiling fan and motion of a pendulum?

Answer: Motion of ceiling fan is circular motion and motion of a pendulum is periodic motion.

6: What is circular motion? Give example.

Answer: When an object moves in a circular path, such motion is called circular motion. For example- Motion of a point marked on the blade of an electric fan is a circular motion.

7: Why can't we use elastic tape to measure distances?

Answer: We can't use elastic tape to measure distances because we will not know how much we stretched the tape during measurement. It will cause error.

8: What is periodic motion? Give example.

Answer: An object repeats its motion after some time; this type of motion is called periodic motion. For example- Motion of a pendulum is a periodic motion.

**9: Arrange the following in increasing order:
1 km, 5 cm, 10 mm**

Answer: 10 mm, 5 cm, 1 km

10: The distance between ram's house and Ravi's house is 3000 m. Express it in km.

Answer: 1000 m = 1km. Therefore 3000 m = 3km.

11: What is the difference between motion of a falling stone and motion of a stone tied to a tread and whirled with hand?

Answer: The motion of a falling stone is rectilinear motion and motion of a stone tied to a tread and whirled with hand is circular motion.

12: A thread is 2 m long. Express its length in cm and mm.

Answer: 200 cm and 2000 mm

13: How can we measure a curved line?



Answer: We can measure the length of a curved line by using a thread. Measure the length between the beginning and final mark on the thread.

14: Reena is 10 cm taller than shikha. Height of shikha is 160 cm. What is height of Reena?

Answer: Height of Reena is 170 cm.

15: Arrange the following in decreasing order:

1 km, 1 mm, 1 cm, 1 m

Answer: 1 km, 1 m, 1 cm, 1 mm.

16: What is the difference between rectilinear and circular motion?

Answer: When objects move along a straight line such motion is called rectilinear motion. Whereas when an object moves in a circular path, such motion is called circular motion.

17: Name some units of length?

Answer: Units of length are kilometres, metres, centimetres, millimetres etc.

18: What is the difference between kilometres and kilogram?

Answer: Kilogram is the unit of weight whereas a kilometre is unit of length.

19: Fill in the blanks:

1. Motion of wheel of car is _____ motion.

2. Motion of strings of guitar is _____ motion.

3. 3 km is equal to _____ m.

4. Motion of a pendulum is _____ motion.

Answer:

1. circular
2. Periodic
3. 3000
4. Periodic.

20. State two precautions to be observed while measuring length with the help of a metre scale.

Answer: Two precautions are:

- (i) The initial point of distance must coincide with the zero reading of metre scale.
- (ii) The eye should be kept in line with the point of measurement.

21. Define rest and motion.

Answer: The objects which do not change their positions with time are said to be at rest. The objects which change their positions with time are said to be in motion.

22. How can a measured length be expressed?

Answer: Each measurement has:

- (i) A number describing the numerical value.
- (ii) The unit in which that quantity is measured.

23. What kind of motions does a screw that is turned undergo?

Answer: A screw undergoes circular (rotation) and periodic motions.

24. Why do we say that the distance of the stone (held with a string) from your hand is the same when we whirl it around?



Answer: The distance of the stone from one's hand is the same when we whirl it around, as it moves circular motion.

25. Correct the following.

(i) The motion of a swing is an example of rectilinear motion.

Answer: The motion of a swing is an example of periodic motion.

(ii) 1 m = 1000 cm

Answer: 1 m = 100 cm

26. Write one example for each of the following types of motion. [NCERT Exemplar]

(i) Rectilinear

Answer: Falling stone

(ii) Circular

Answer: Tips of the hands of a clock

(iii) Periodic

Answer: Motion of pendulum

(iv) Circular and periodic

Answer: Hands of a clock

27. How can the thickness of a coin be measured?

Answer: Take ten coins and put them one above the other. Measure the thickness of the coins with a scale and divide the total thickness with number of coins

Long Answers Type Questions

1: What are different types of motion? Explain with example.

Answer: When objects move along a straight line such motion is called rectilinear motion. A sprinter in 100m race move along a straight track. This is an example of rectilinear motion. When an object moves in a circular path, such motion is called circular motion. For example- Motion of a point marked on the blade of an electric fan is a circular motion. An object repeats its motion after some time; this type of motion is called periodic motion. For example- Motion of a pendulum is a periodic motion

2. Why do we need standard unit for measurement?

Answer: We need standard unit for measurement to make our judgement more reliable and accurate. For proper dealing, measurement should be same for everybody. Thus there should be uniformity in measurement. For the sake of uniformity we need a common set of units of measurement, which are called standard units. Nowadays SI units are used in science and technology almost universally.

3. What type of motion do the following objects have?

(a) the galloping of a horse

(b) the needle of a sewing machine

(c) the movements of a mosquito

(d) the blades of an electric fan

(e) the smoke from a lighted dhoopbatti

(f) wheels of moving car.



Answer:

- (a) The galloping of a horse: Linear motion.
- (b) The needle of a sewing machine: Periodic motion.
- (c) Movement of a mosquito: Random motion.
- (d) Blade of an electric fan: Circular motion.
- (e) The smoke from a lighted dhoopbatti: Random motion.
- (f) Wheels of moving car: Linear motion and Rotational motion.

4. Give two examples for each of the following motions:

- (i) Linear motion**
- (ii) Spinning motion**
- (iii) Oscillatory motion**
- (iv) Periodic motion**
- (v) Vibrational motion**
- (vi) Circular motion**
- (vii) Random motion**

Answer:

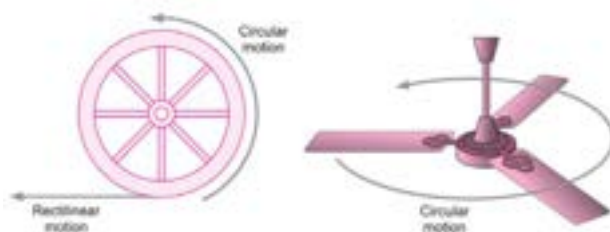
- (i) Linear motion: (a) Rolling of ball on ground, (b) Moving of bicycle on road,
- (ii) Spinning motion: (a) Rotating fan, (b) Wheel of sewing machine.
- (iii) Oscillatory motion: (a) Pendulum of clock, (b) Motion of a child on a swing,
- (iv) Periodic motion: (a) Pendulum of clock, (b) Motion of a swing, heartbeat.
- (v) Vibrational motion: (a) String of a guitar, (b) Surface of drums.
- (vi) Circular motion: (a) Rotation of fan, (b) Bicycle wheel.
- (vii) Random motion: (a) Motion of football players, (b) Movement of mosquito.

5. While travelling in a train, it appears that the trees near the track are moving whereas co-passengers appear to be stationary. Explain the reason.

Answer: When we see the trees from a moving train, their position is changing with respect to us. Hence, they appear to be moving. On the other hand, the position of co-passengers is not changing with respect to us, hence they appear to be stationary.

6. How are the motions of a wheel of a moving bicycle and a mark on the blade of a moving electric fan different? Explain.

Answer: The wheel of a moving bicycle depicts circular as well as rectilinear motion whereas a blade of a moving electric fan shows only circular motion.



7. Three students measured the length of a corridor and reported their measurements. The values of their measurements were different. What could be the reason for difference in their measurements? (Mention any three.)

Answer: Some of the reasons for difference in their measurements could be:

- Different measuring devices were used.
- The smallest length that could be measured by different devices may be different.
- Measurement may not be along the shortest length in all three cases.
- The end of the corridor may not be easily accessible.
- The measuring devices may be faulty (not standardised).

8. Boojho was riding in his bicycle along a straight road. He classified the motion of various parts of the bicycle as (i) rectilinear motion, (ii) circular motion and (iii) both rectilinear as well as circular motion. Can you list one part of the bicycle for each type of motion? Support your answer with reason.

Answer: (i) Handle bar or seat because handle or seat is moving along a straight road, not rolling.

(ii) Pedal because it is rolling around a fixed centre by the foot.

(iii) Wheel because it is rolling and also moving along a straight road.

9. Distinguish between the following.

(i) Rectilinear motion and Circular motion

Answer:

Rectilinear motion	Circular motion
Movement along a straight line from one position to another.	Movement in a circular manner in relation to its own axis or around a fixed centre.
For example, a bus moving on a straight highway	For example, a spinning top.

(ii) Rotational motion and Periodic motion

Answer:

Rotational motion	Periodic motion
Movement in a circular path in relation to its own fixed axis.	Oscillatory movement along the same path again and again with same speed.
For example, blades of a moving fan.	For example, pendulum of a clock.

(iii) Rest and Motion



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