



**STATE COUNCIL OF EDUCATIONAL RESEARCH & TRAINING  
TELANGANA, HYDERABAD.**

**Class: IX**

**LEVEL - 2**

**Subject: Physical Science**

**Name of the lesson: MOTION. Topic: Distance - Displacement WORKSHEET: 10**

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**KEY CONCEPTS**

- Distance
- Displacement
- Scalars and Vectors

**LEARNING OUTCOMES**

**students can**

1. differentiate between distance and displacement
2. solve problems related to distance and displacement
3. draw displacement vectors
4. give examples for scalars and vectors
5. identify the quantities as scalar or vector

**INTRODUCTION**

In our daily life we frequently use the terms nearer and farther. Similarly observe the following questions which come across in our daily life in different situations

- How far is your house from school?
- How far is your classroom from the headmaster's room?
- What is the distance from Salarjung museum to Charminar?

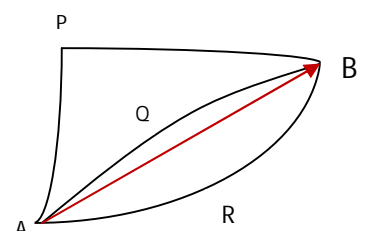
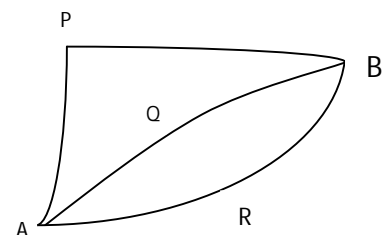
➤ **WHAT IS DISTANCE**

The measure of change in position of a body between two points is called distance. i.e. **Distance is the actual length of the path traversed by an object between two points in a given interval of time.** Distance between two points is not always constant as it depends on the path chosen.

\_\_\_\_\_ In fig.1 the distance between points A & B are given along three different paths (APB, AQB, ARB). Hence the distance between 'A' & 'B' is of three types.

➤ **DISPLACEMENT**

In fig.2 when two points are joined with a straight line it represents a shorter path or distance compared to the other three paths. **This shortest path or distance between two points is called 'Displacement'.**



## ➤ SCALARS AND VECTORS

In fig.1 you might have noticed that while measuring distance between 'A' & 'B' no specific direction is considered irrespective of the path. The physical quantity which doesn't require a specific direction for its representation is called **scalar quantity**. Therefore Distance is a scalar quantity as it has only magnitude and no direction in its representation.

As shown in fig.2 the displacement between 'A' & 'B' is measured along a specific direction, hence displacement possesses both magnitude and direction. Such a quantity which has both magnitude and direction is called a **vector quantity**.

★ A vector can be represented as a directed line segment. Its length indicates magnitude and arrow indicates direction. Point 'A' is called tail and point 'B' is called head.



The SI unit of distance (or) displacement is metre denoted by 'm'. Other units such as kilometer, centimeter etc. are also used to express this quantity.

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

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

As shown in fig.2 the path APB, AQB, ARB indicates the actual paths traversed by a body whereas straight line path AB indicates displacement. Here  $\vec{AB}$  is called a displacement vector.

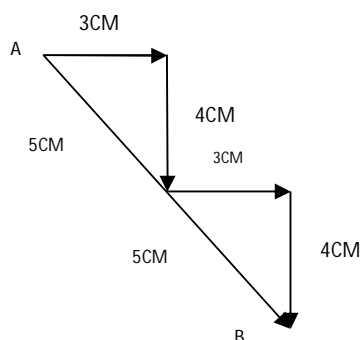
### Note:

➤ In case of distance  $AB = BA$ , but in case of displacement  $\vec{AB} \neq \vec{BA}$ , because in  $\vec{AB}$  the arrow head shows that the object is displaced from A to B, whereas in  $\vec{BA}$  the arrowhead shows that the object is displaced from B to A, hence  $\vec{AB} \neq \vec{BA}$  but  $\vec{AB} = -\vec{BA}$

➤ If an object returns to the starting point after travelling some distance, then displacement becomes zero. Since initial and final points are the same.

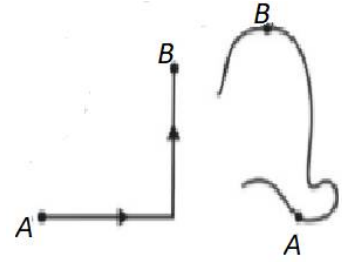
### Example 1:

In the below figure the distance between A & B is 14cm whereas displacement from 'A' to 'B' is 10cm.



**Example 2:**

Draw the displacement vectors from 'A' to 'B' in the adjacent figure



**ASSESSMENT**

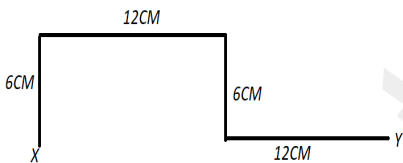
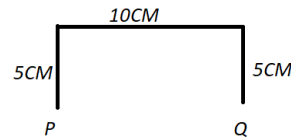
1. Write differences between distance and displacement.
2. Can distance be less than the magnitude of displacement? Why?
3. Do you agree with your friend who says “the ratio of distance and displacement never be less than one”. If so why?
4. If a person walks along a circular path of circumference 40cm reaches the same point from where he started then what is his displacement and distance travelled by him?
5. A person travels a distance of 18km towards east and returns along the same path and travels for 5km. Find distance covered by him and displacement produced by him.
6. The distance and displacement between P&Q in the below figure are respectively. ( )

A) 5cm, 10cm

B) 20cm, 10cm

C) 10cm, 20cm

D) 10cm, 5cm



7. The ratio of distance and displacement between X & Y in the following figure is ( )

A) 2/3

B) 1/2

C) 3/2

D) 1/3

8. Choose the incorrect statement based on the below figure ( )



- A) The distance from P to Q and Q to P are equal
- B) The displacement from P to Q and Q to P are equal
- C) The displacement from P to P is zero
- D) The sum of displacements from P to Q and Q to P is zero

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