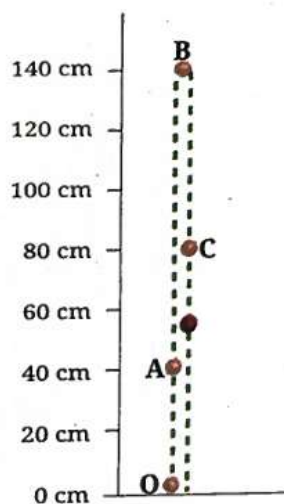


## Distance and Displacement (NCERT Questions)

### Activity 4.1.

As shown in figure, a ball is thrown vertically upwards from O. It moves up straight till B and then falls back to O.



(a) Can this be considered a motion in a straight line?

(b) For this motion, fill up the values in given table:

**TABLE 4.1: Distance travelled and displacement of the ball**

S. No.	Position	Total distance travelled by the ball from O till that position	Displacement of the ball from O till that position
1.	O	0 cm	0 cm
2.	A	40 cm	40 cm in upward direction
3.	B		
4.	C		
5.	O		

(c) Analyse the data filled in table and choose which of the following is true for displacement:

- (i) It is never zero.
- (ii) Its magnitude can be greater than the total distance travelled.
- (iii) Its magnitude is less than or equal to the total distance travelled.
- (iv) Its magnitude is less than the total distance travelled in all cases.

Q2. In the example of an athlete running back and forth on a straight track (Fig. 4.4),

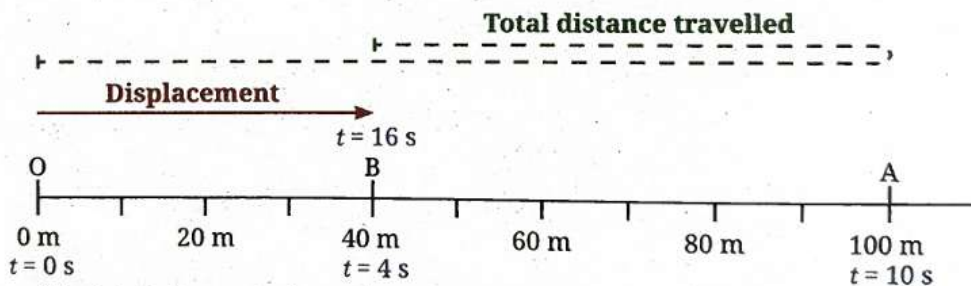


Fig. 4.4: Reference point and positions of athlete at different instants of time

when will the displacement of the athlete be zero? What will be the total distance travelled in that case?

Q3. Fuel used up in a vehicle depends on which of the following? Justify your answer.

- (i) Total distance travelled
- (ii) Displacement

Q4. A ball rolls down an inclined track as shown in Fig. 4.6. Is its motion, a straight line motion? Assuming the starting point of the ball (O) to be the origin, can its motion from O to D be depicted using a horizontal line? Are the values of total distance travelled and magnitude of displacement from O equal or different at positions A, B, C and D?

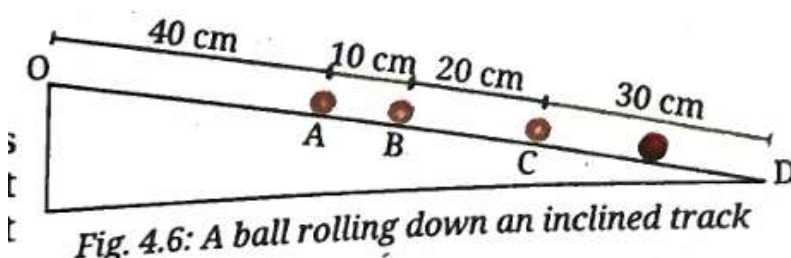


Fig. 4.6: A ball rolling down an inclined track

**Questions from back exercise**

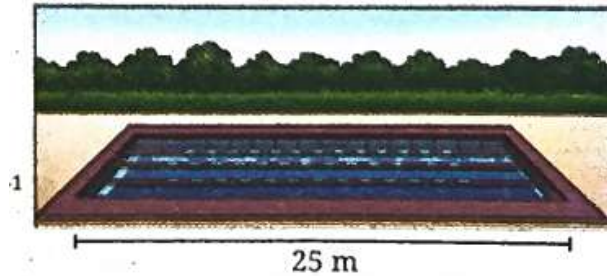
Q5. My father went to a shop from home which is located at a distance of 250 m on a straight road. On reaching there, he discovered that he forgot to carry a cloth bag. He came home to take it, went to the shop again, bought provisions and came back home. How much was the total distance travelled by him? What was his displacement from home?

Q6. A student runs from the ground floor to the fourth floor of a school building to collect a book and then comes down to their classroom on the second floor. If the height of each floor is 3 m, find:

- (i) the total vertical distance travelled, and
- (ii) their displacement from the starting point.

## Average Speed and Average Velocity

Q1. Sarang takes 50 seconds to swim from one end to the other end and back in the swimming pool shown in Fig. 4.7. Find his average speed and average velocity within the time interval of 50 s.



*Fig. 4.7: Swimming pool*

Q2. 4. During a family road trip, you drive 200 km north in three hours. Afterwards, you drive 200 km south in two hours. Find the average speed and average velocity for your entire trip.

Q3. Under what condition(s) is the

- (i) magnitude of average velocity of an object equal to its average speed?
- (ii) magnitude of average velocity of an object zero while its average speed is not zero?

## Average Acceleration

### Activity 4.2:

The magnitude of average acceleration of cars is generally specified as the time taken by the car to go from  $0 \text{ km h}^{-1}$  to  $100 \text{ km h}^{-1}$ . Look it up on the internet and find this time for various cars, and record those in Table 4.2.

Calculate the magnitude of average acceleration for each car.

**Table 4.2: The magnitude of average acceleration in a time interval**

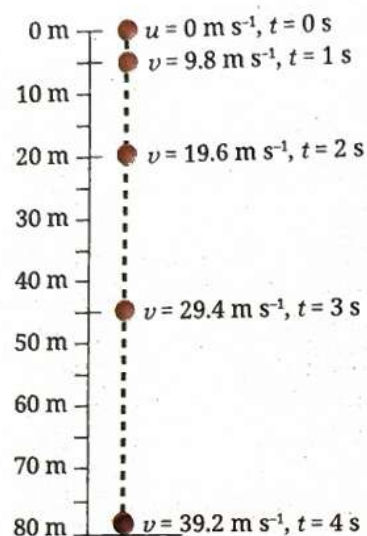
Car type	Time interval during which the speed goes from $0$ to $100 \text{ km h}^{-1}$	Magnitude of average acceleration ( $\text{m s}^{-2}$ )

Q1. A bus is moving on a long straight highway with a velocity of  $36 \text{ km h}^{-1}$ . The driver presses the accelerator for a time interval of  $10 \text{ s}$  and velocity of the bus increases to  $54 \text{ km h}^{-1}$ . For some time, the bus moves at a constant velocity. Then, the driver notices an obstacle on the road ahead and presses the brake. The bus comes to a stop in a time interval of  $5 \text{ s}$ . Find the average acceleration in the two time intervals,

- (i) when the accelerator was pressed, and
- (ii) when the brakes were pressed.

time intervals), the acceleration of the object is constant.

Q2. As we learnt earlier, when an object is dropped from a height, it takes a straight vertical path downwards before touching the ground. While coming down, the velocity of the object increases as shown in Fig. 4.10 at different instants. Find the magnitude of the average acceleration of the object in every successive interval of a second. Is the average acceleration constant across all intervals? What is the direction this average acceleration?



### Question from back exercise

Q3. A girl is riding her scooter and find that its speedometer reading is constant. Is it possible for her scooter to be accelerating and if so, how?