|Displacement| ≤ Distance

negative sign indicates the direction of displacement. Thus, it is not necessary to use vector notation for discussing motion of objects in one-dimension.

The magnitude of displacement may or may not be equal to the path length traversed by an object. For example, for motion of the car from O to P, the path length is +360 m and the displacement is +360 m. In this case, the magnitude of displacement (360 m) is equal to the path length (360 m). But consider the motion of the car from O to P and back to Q. In this case, the path length = (+360 m) + (+120 m) = + 480 m. However, the displacement = (+240 m) – (0 m) = + 240 m. Thus, the magnitude of displacement (240 m) is not equal to the path length (480 m).

The magnitude of the displacement for a course of motion may be zero but the corresponding path length is **not zero**. For example, if the car starts from O, goes to P and then returns to O, the final position coincides with the initial position and the displacement is zero. However, the path length of this journey is OP + PO = 360 m + 360 m = 720 m.

Motion of an object can be represented by a position-time graph as you have already learnt about it. Such a graph is a powerful tool to represent and analyse different aspects of motion of an object. For motion along a straight line, say *X*-axis, only *x*-coordinate varies with time and we have an *x-t* graph. Let us first consider the simple case in which an object is stationary, e.g. a car standing still at $x = 40$ m. The position-time graph is a straight line parallel to the time axis, as shown in Fig. 3.2(a).

If an object moving along the straight line covers equal distances in equal intervals of time, it is said to be in **uniform motion** along a straight line. Fig. 3.2(b) shows the position-time graph of such a motion.

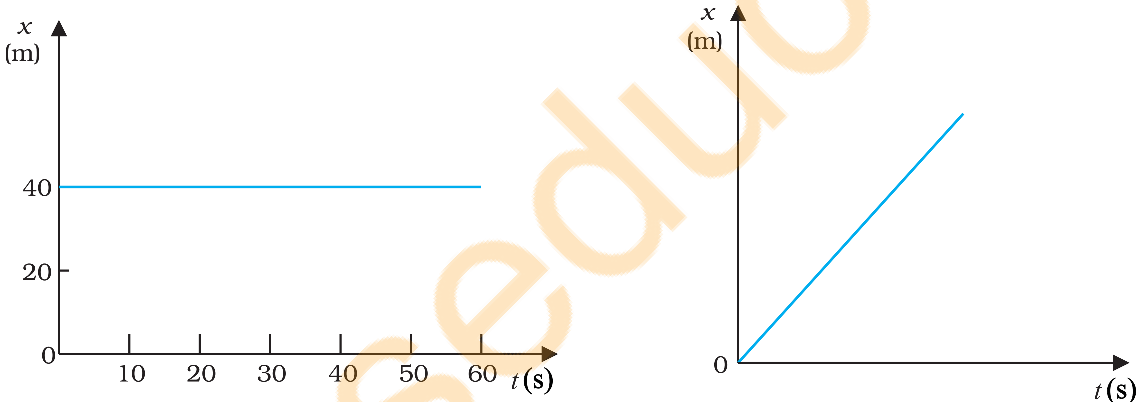

Fig. 3.2 *Position-time graph of (a) stationary object, and (b) an object in uniform motion.*

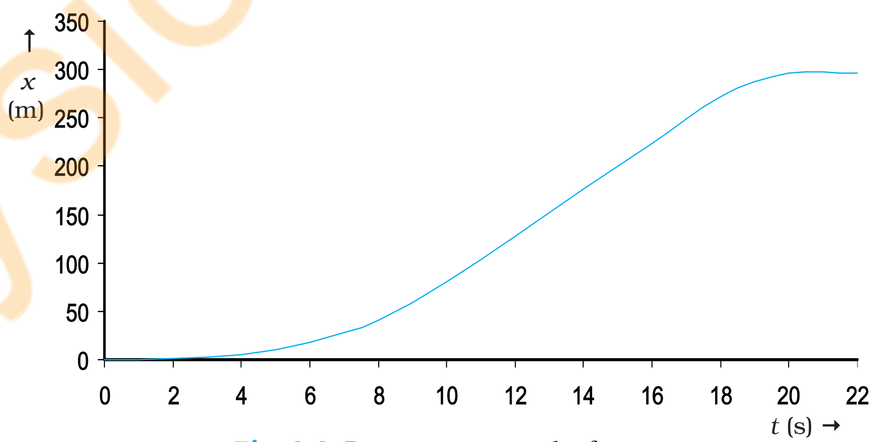

Fig. 3.3 *Position-time graph of a car.*