

CHAPTER FOUR



11086CH04

MOTION IN A PLANE

PHYSICS with BOSE Sir ; Website : physicseducour.in

- 4.1 Introduction
- 4.2 Scalars and vectors
- 4.3 Multiplication of vectors by real numbers
- 4.4 Addition and subtraction of vectors — graphical method
- 4.5 Resolution of vectors
- 4.6 Vector addition — analytical method
- 4.7 Motion in a plane
- 4.8 Motion in a plane with constant acceleration
- 4.9 Relative velocity in two dimensions
- 4.10 Projectile motion
- 4.11 Uniform circular motion

Summary
Points to ponder
Exercises
Additional exercises

4.1 INTRODUCTION

In the last chapter we developed the concepts of position, displacement, velocity and acceleration that are needed to describe the motion of an object along a straight line. We found that the directional aspect of these quantities can be taken care of by + and – signs, as in one dimension only two directions are possible. But in order to describe motion of an object in two dimensions (a plane) or three dimensions (space), we need to use vectors to describe the above-mentioned physical quantities. Therefore, it is first necessary to learn the language of vectors. What is a vector? How to add, subtract and multiply vectors? What is the result of multiplying a vector by a real number? We shall learn this to enable us to use vectors for defining velocity and acceleration in a plane. We then discuss motion of an object in a plane. As a simple case of motion in a plane, we shall discuss motion with constant acceleration and treat in detail the projectile motion. Circular motion is a familiar class of motion that has a special significance in daily-life situations. We shall discuss uniform circular motion in some detail.

The equations developed in this chapter for motion in a plane can be easily extended to the case of three dimensions.

4.2 SCALARS AND VECTORS

In physics, we can classify quantities as scalars or vectors. Basically, the difference is that a **direction** is associated with a vector but not with a scalar. A scalar quantity is a quantity with magnitude only. It is specified completely by a single number, along with the proper unit. Examples are : the distance between two points, mass of an object, the temperature of a body and the time at which a certain event happened. The rules for combining scalars are the rules of ordinary algebra. Scalars can be added, subtracted, multiplied and divided

Def.

✓

PHYSICS with BOSE Sir ; Website : physicseducour.in