Note that if the formula of Newton's second law contained the velocity and not the acceleration, this relationship of the past and present would not be revealed. In this case, the velocity of a body at a given instant (i.e. the nature of its motion at a given instant) would be fully determined by the forces acting on the body precisely at this instant; the past would have no effect whatsoever on the present.

I want to cite one more example illustrating the aforesaid.

A ball hanging on a string is subject to the action of two forces, the weight and the tension of the string. If it is deflected to one side of the equilibrium position and then released, it will begin to oscillate.

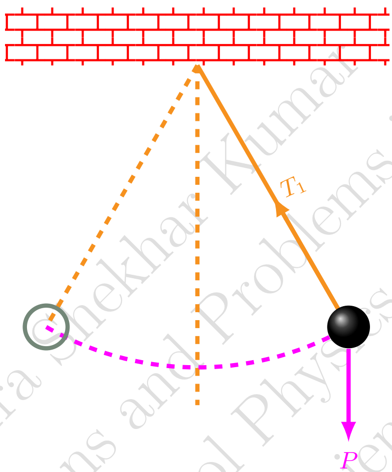

Figure 4.3: Oscillating ball

If, however, a definite velocity is imparted to the ball in a direction perpendicular to the plane of deviation, the ball will begin to travel in a circle at uniform velocity.

As you can see, depending upon the initial conditions, the ball either oscillates in a plane (see Fig. 4.3), or travels at uniform velocity in a circle (see Fig. 4.4). Only two forces act on it in either case: its weight and the tension of the string. ◊

. I haven't considered Newton's laws from this viewpoint. ■

4.12. No wonder then that some students, in trying to determine the forces applied to a body, base their reasoning on the nature of motion without first finding out what bodies interact with the given body. You may recall that you did the same. That is exactly why, when drawing Fig. 2.7 and Fig. 2.8, it seemed to you that the sets of forces applied to the body in those cases should be different. Actually, in both cases two forces are applied to the body: its weight and the tension of the string. ◊