1. A 0.75 kg basketball strikes the backboard while travelling at an angle of 45 degrees above the horizontal with a speed of 20 m/s, and it leaves the backboard travelling horizontally with a speed of 15 m/s. If the ball and backboard are in contact for 1.25 ms, find the horizontal and vertical components of the force acting on the ball.
2. Two billiard balls of equal mass collide on a pool table. Ball A which was initially travelling at 2 m/s, is deflected 20 degrees from its original direction. Asteroid B was originally at rest, and travels 60 degrees from the original direction of A. Find the speed of each asteroid after the collision and find the fraction of the kinetic energy of asteroid A dissipated during the collision.
3. A 20 kg block is attached to a light horizontal spring of k=500 N/m and is resting on a table with coefficient of friction 0.2. The block is struck by a 2 kg projectile travelling horizontally at 25 m/s. Find how far the block travels if (a) the projectile rebounds with a speed of 8 m/s or if (b) the projectile remains embedded in the block.