**5C Oblique Impacts with Two Smooth Spheres**

1. A smooth sphere A, of mass 2kg and moving with speed 6ms-1 collides obliquely with a smooth sphere B of mass 4kg. Just before the impact B is stationary and the velocity of A makes an angle of 60˚ with the lines of centres of the two spheres. The coefficient of restitution between the spheres is . Find the magnitudes and directions of the velocities of A and B immediately after the impact.
2. A small smooth sphere A of mass 1kg collides with a small smooth sphere B of mass 2kg. Just before the impact A is moving with a speed of 4ms-1 in a direction of 45˚ to the line of centres and B is moving with speed 3ms-1 at 60˚ to the line of centres. Given that the coefficient of restitution between the spheres is and that the spheres collide, find:
3. The kinetic energy lost in the impact
4. The magnitude of the impulse exerted on A by B
5. A smooth sphere of mass 5kg is moving on a smooth horizontal surface with velocity . Another smooth sphere of mass 3kg and the same radius as is moving on the same surface with velocity . The spheres collide when their line of centres is parallel to . The coefficient of restitution between the spheres is . Find the velocities of both spheres after the impact.
6. Two small smooth spheres and have equal radii. The mass of is kg and the mass of is kg. The spheres are moving on a smooth horizontal plane and they collide. Immediately before the collision the velocity of is and the velocity of is . Immediately after the collision the velocity of is . Find:
7. The speed of immediately after the collision
8. A unit vector parallel to the line of centres of the spheres at the instant of collision