


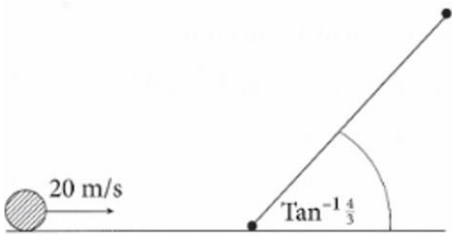


Assess your learning – Impacts and Collisions Rate your understanding of this chapter (<i>be honest!</i>)	 No	 Kinda	 Yes	Revised for Week 20 Exam	Revised for Week 30 Exam
<p>I can calculate the velocity of a particle, loss in kinetic energy, and the impulse imparted, after it impacts on horizontal ground.</p> <p>E.g. A ball of mass 4 kg falls to the ground from a height of 8 m. The coefficient of restitution is $\frac{1}{8}$. Find:</p> <p>(i) the speed of the ball just before impact (ii) the impulse imparted to the ball (iii) the loss in kinetic energy</p>					
<p>I can solve problems involving a particle striking a plane at an angle.</p> <p>E.g. A ball of mass m moves horizontally with speed 20 m/s towards a barrier as shown below, which makes an angle $\tan^{-1}\frac{4}{3}$ with the horizontal. The coefficient of restitution is $\frac{2}{3}$. Find:</p> <p>(i) the speed of the ball after impact (ii) the magnitude of the impulse due to the impact (iii) the loss in kinetic energy (iv) the tan of the angle between the ball's new path and the horizontal</p> 					
<p>I can solve problems involving direct collisions.</p> <p>E.g. Two elastic spheres of mass 4 kg and 2 kg are moving in opposite directions and collide directly. The speeds before collision are 5 m/s and 3 m/s respectively. If the coefficient of restitution between the spheres is $\frac{1}{5}$, calculate:</p> <p>(i) the speed of each sphere after the collision (ii) the loss in kinetic energy due to the collision suffered by the 4 kg sphere (iii) the change in momentum of the 2 kg sphere</p>					
<p>I can solve problems involving three particles colliding directly.</p> <p>E.g. Three spheres of mass 2 kg, 4 kg and 7 kg move in the same line with velocities $8\vec{i}$, $2\vec{i}$ and $4\vec{i}$ respectively. If the 2 kg strikes the 4 kg mass first, find how many collisions occur.</p>					

I can calculate solve problems involving oblique collisions.

E.g.

A sphere of mass $3m$,moving with velocity $4\vec{i} + 3\vec{j}$ collides obliquely with another sphere that is at rest. If the coefficient of restitution is $\frac{1}{3}$, find:

- (i) the velocities of each sphere after impact
- (ii) the impulse imparted to each sphere during impact
- (iii) the percentage loss in kinetic energy
- (iv) the angle through which the heavier mass is deflected

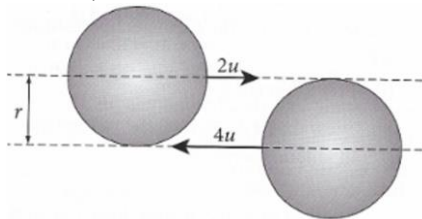
I can solve harder problems involving oblique collisions where the angle of one particle is given after the collision.

E.g. A smooth sphere P impinges obliquely with an identical smooth sphere Q , which is at rest. The direction of P before and after impact makes angles 30° and θ , with the line of centres of impact. The coefficient of restitution is e .

- (i) Calculate the value of $\tan \theta$, in terms of e .
- (ii) For what value of e will the kinetic energies of P and Q after impact be in the ratio 5: 1 ?

I can solve problems involving two particles colliding with their centres not aligned.

E.g. Two spheres of radius r move horizontally in opposite directions as shown below. The first has mass $2m$ and speed $2u$, the second has mass m and speed $4u$. The coefficient of restitution is $\frac{1}{\sqrt{3}}$. He centres of the two spheres lie on two parallel lines, a distance r apart.



Find the speeds of the spheres after impact.