Sample Question

Q. Suppose you are in a train that is moving with a constant speed u. While looking at the view outside, you notice that a particle is moving with a velocity of magnitude v in the direction opposite to the motion of train. You also notice another particle moving with a velocity of magnitude u again in the direction opposite to the motion of train. The two particles collide and the first particle comes to rest while the second particle attains a velocity of magnitude w in the same direction it was moving before the collision. The train now deviates an angle θ from its original direction, towards the particles. You now see that the first particle is moving with speed w while the second particle is moving with speed v. If $v + u$ is taken as k and e is coefficient of restitution, θ may be given by:

(a) $2sin^{-1}\left[\sqrt{\frac{w^2}{2u^2} - \frac{u}{2w} - \frac{kw}{4u^2e}}\right]$

(b) $sin^{-1}[1 - \frac{u}{w}]$

(c) $2sin^{-1}[\sqrt{(\frac{w}{2u} - \frac{u}{2w} - \frac{k}{4ue})}]$

(d) $\frac{\pi}{2}$