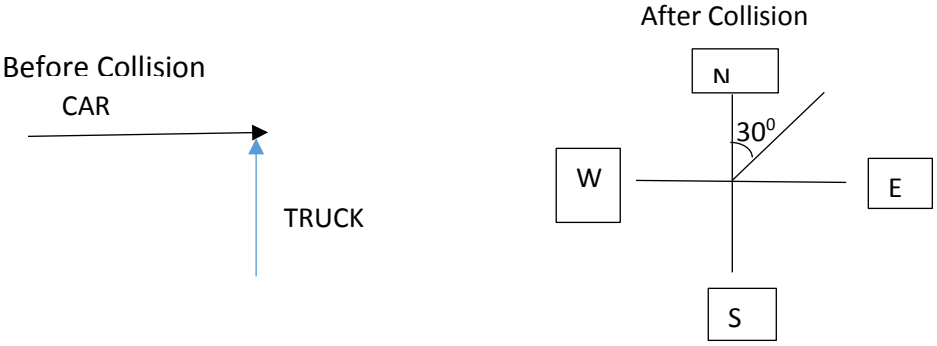
Answer on Question # 73682, Physics- Mechanics -Relativity:

Question: At a crossing a truck travelling towards the north collides with a car travelling towards the east. After the collision the car and the truck stick together and move off at an angle of 30 ^{0} east of north. If the speed of the car before the collision was 20 ms−1, and the mass of the truck is twice the mass of the car, calculate the speed of the truck before and after the collision.

Solution: Let us consider mass of car is m and v_i be the velocity before collision. And after collision together velocity is v. So, as per question given mass of the truck is 2m and v_t be its velocity before collision.



Let us apply momentum conservation law,

$2m \times v_t = (2m + m)v \cos 30^0$ and $m \times 20 = (2m + m)v \sin 30^0$

Or, $v_t = 1.5\ v\ (0.866)$ ……(1) or, $v = 13.33$ m/s (as $\sin 30^0 = 0.5$) ……(2)

Put the value of v from equation (2) to equation (1), we get,

$V_t = 17.32$ m/s.

Answer: Speed of the truck before and after collisions are 17.32 m/s and 13.33 m/s respectively.