

Question #76563, Physics / Classical Mechanics

A truck traveling towards the north collides with a car traveling towards the east. After collision the car and truck stick together and move off at an angle of 30 degree east of north. If the speed of car before collision was 20 m per second and mass of the truck is twice of car, calculate the speed of truck before and after collision?

Solution

From the conservation of momentum (eastwards):

$$mv = (m + m)v_A \sin 30$$

$$mv = 2mv_A \frac{1}{2}$$

The speed of truck after collision:

$$v_A = v = 20 \frac{m}{s}$$

From the conservation of momentum (northwards):

$$mv_B = (m + m)v_A \cos 30$$

The speed of truck before collision:

$$v_B = 2v_A \cos 30 = 2v_A \frac{\sqrt{3}}{2} = v_A \sqrt{3} = 20\sqrt{3} \approx 35 \frac{m}{s}$$

Answer provided by <https://www.AssignmentExpert.com>