Q- A boat of mass 250kg is coasting, with its engine in neutral, through the water at speed 3.00m/s when it starts to rain. The rain is falling vertically, and it accumulates in the boat at the rate of 10.0 kg/hr. What is the speed of the boat after time 2.00hr has passed? Assume that the water is still and resistances are negligible.

According to law of conservation of momentum if there is no external force acting on a system its linear momentum remains conserved.

As there is no external force on the boat and falling water in horizontal direction the linear momentum in horizontal direction will remain conserved.

Mass of the boat initially $m_0 = 250$ kg
Initial velocity of the boat $v_0 = 3.00$ m/s
Hence the initial momentum of the boat = m_0v_0

Mass of the boat and rain water after 2 hours m = 250 + 10*2 = 270 kg
Let the velocity of the boat and the water in it after 2 hours is v
Then its final momentum = m*v

Hence according to law of conservation of linear momentum

Final momentum = initial momentum

Or $m*v = m_0v_0$

Or $v = = m_0v_0/m = 250*3.00/270 = 2.78$ m/s