Chapter 1, Question 2: Rock(-Breathing) Propulsion

A person on a dock throws rocks to a person in a boat who in turn throws them into the water. What is the force (F) on the boat?

- $F = Rm_r (u_{out} - u_{in})$
- $F = R(m_r + m_b)(u_{out} - u_{in})$
- $F = R(m_r + m_b)(u_b - u_{out})$

$L.O. A$

- $R =$ throwing rate (rocks/s)
- $m_b =$ mass of boat and everything in it (kg)
- $m_r =$ mass of one rock (kg)
- $u_{in} =$ velocity of rock in, relative to boat (m/s)
- $u_{out} =$ velocity of rock out, relative to boat (m/s)
- $u_b =$ velocity of boat (m/s)

4) $F = Rm_r (u_b - u_{out} - u_{in})$
5) None of the above
6) I don’t know
The correct answer is 1) $F = R_m (u_{out} - u_{in})$.

The force is equal to the time rate of change of momentum. The impulse is provided by the difference between a mass flow rate of rocks ($R_m r$) which are taken in with a velocity with respect to the boat of $u_{in}$, and a mass flow rate of rocks ($R_m r$) which are ejected with a velocity with respect to the boat of $u_{out}$.

Class response (2004):

Class response (2003):
Question 4: Question 4

Class response (2001):