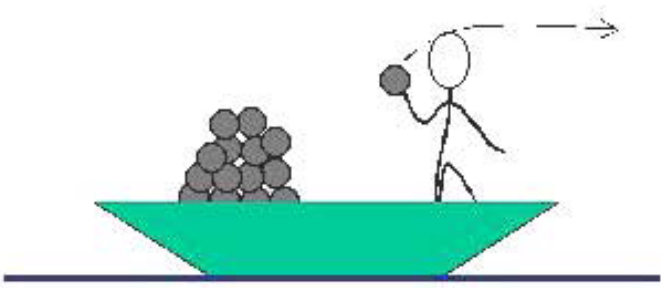
Chapter 1, Question 1: Rock(et) Propulsion

A person throws rocks from a boat. At a given point in time the following parameters are known. What is the force (F) on the boat?



R = throwing rate (rocks/s)
m_b = mass of boat and everything in it (kg)
m_r = mass of one rock (kg)
u_r = velocity of rock relative to boat (m/s)
u_b = velocity of boat (m/s)

1) $F = Rm_ru_r$

2) $F = R(m_r+m_b)u_r$

3) $F = R(m_r+m_b)(u_b-u_r)$

4) $F = Rm_r(u_b-u_r)$

5) None of the above

6) I don't know

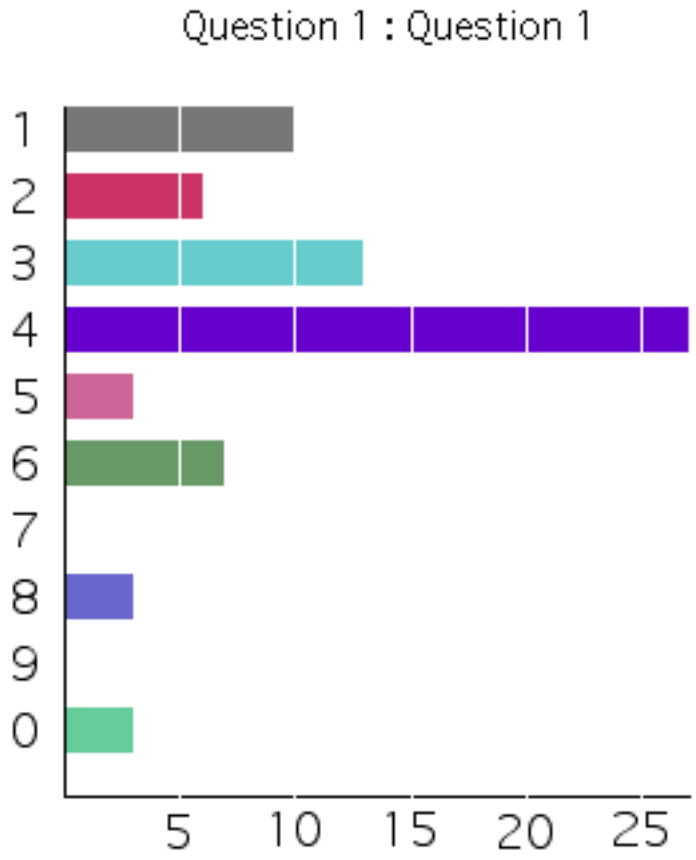
L.O. A

Chapter 1, Question 1 Answer:

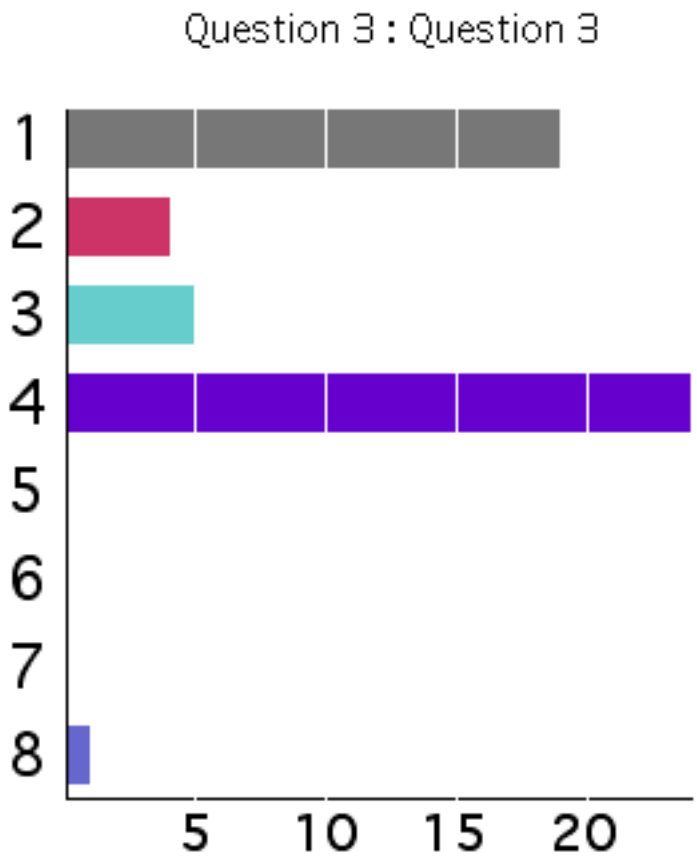
The correct answer is 1) $F=Rm_r u_r$.

The force is equal to the time rate of change of momentum. The impulse is provided by a net mass flow rate of rocks (Rm_r) which are ejected with a velocity with respect to the boat of u_r.

Class response (2004):



Class response (2003):



Class response (2001):

Question 1 : Question 1