

Suppose there are  $N$  nodes that use the slotted ALOHA protocol to contend for a channel. Among these nodes, node  $A$  has more data to transmit and has a transmission probability of  $2p$  while the other nodes' transmission probability is  $p$ .

Provide a formula for node  $A$ 's average throughput. What is the total efficiency of the protocol with these nodes?