Name: Wang Yuanxi Student ID: a1805637

Assumptions: There are no other outcomes other than those listed (i.e. can only sink, damage, or miss)

Model: The probability that Captain Sparrow sinks Jones' ship is equal to one minus the probability that Captain Sparrow does not sink Jones' ship: $P(sink) = 1 - P(does\ not\ sink)$.

Since Captain Sparrow has a $^1/_4$ chance to miss each shot, and a $^1/_4$ chance to damage the ship, the chance that he does not sink the ship is the probability of him missing every shot plus the probability that he manages to damage the ship once and only once.

Solution: Thus, the solution from the information given is:

$$P(does\ not\ sink) = (^1/_4)^4 + 4\left(\left(^1/_4\right)^3 \times \left(^1/_4\right)\right) = {}^5/_{256}$$

$$P(sink) = 1 - {}^5/_{256} = {}^{251}/_{256}$$

The probability that Captain Sparrow would be able to sink Jones' ship is 251/256.

Discussion: It is important to assume that Jones' ship can only exist in 2 states, sunk or not sunk. Even while damaged, it would still be in the 'not sunk' state. Using this assumption, we can formulate that if the ship were 'sunk', it cannot simultaneously be 'not sunk', and thus the equation in the model is accurate. In the question, it is also given that Captain Sparrow would stop firing when the ship was sunk, but this is irrelevant, as it does not matter whether or not he stops firing after the ship had already been sunk.