CSCI432 Homework 3

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1 What is the loop invariant of the while loop in dutchFlagPartition?

A.subList(0, smaller) $\leq$ A.sublist(smaller, equal) $\leq$ A.sublist(equal, larger) $\leq$ A.(larger, A.size())

2 Given an array A of n objects with boolean-valued keys, what is an algorithm to reorder the array so that objects that have a FALSE key appear first? The relative ordering of objects with the same key should remain the same (in words, this should be a stable sorting algorithm). Use O(1) additional space and O(n) time.

FALSE key order
in: boolean array
out: stable sorted boolean array
f = 0
for i in array **do**
  if array[i] == FALSE **then**
    swap(array[f],array[i])
    f++
  end if
end for

3 Suppose you have an unfair coin, where the probability of landing heads (H) is 25 and the probability of tails (T) is 75.

3.1 What is the expected number of coin tosses until one head turns up?

Well, since theres a 75% if getting a tails, our expected number of flips is 4

4 What is the expected number of coin tosses needed in order to obtain three consecutive heads.

$$X = \frac{1 - p^h}{p^h(1 - p)}$$

$$X = \frac{1 - .25^3}{.25^3(1 - .25)} = 84$$

Source: https://www.quora.com/What-is-the-expected-number-of-coin-flips-until-you-get-two-heads-in-a-row