**HW - Week 13**

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5.2-3: Since there are 6 sides to a dice, the probability of getting each side would be

Hence, the expected value for dice i would be

Accordingly, given n dices, since the dices are similar and have the same expeteced value, we have that

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5.4-2: Suppose that we toss balls into b bins until some bin contains two balls. Each toss is independent, and each ball is equally likely to end up in any bin. What is the expected number of ball tosses?

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**5-2.h:** In the case that k=0, then the condition A[i]=x is never met, which makes the worst running time n. The expected running time would also be n since all of the elements have to be scanned to ensure that the no element satisfies the condition.

If k=1, the worst running time occurs when x is at the last position of the array, which takes n since all the elements have to be scanned. For the expected running time, since x could be in either of the n positions of A, the probability of x being in a position i would be

Hence, let m denote the position of X in the array; the expected value of scans to find X would be

**5-2.i:** I would use DETERMINSTIC-SEARCH. The average time for RANDOMIZED\_SEARCH would be n(ln(n)+O(1)) whereas the the average expected running time for the DETERMINSTIC\_SEARCH and SCRAMBLE\_SEARCH is n, as previously shown. Moreover, generating the permutations in SCRAMBLE\_SEARCH has a linear time complexity n, which makes DETERMINSTIC\_SEARCH more efficient.

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8.4-4: The area of the circle is . We can consider the circle as a set of n rings, each having an area of . Let us assume that each ring starts at distance of the center and ends at radius . Hence, it can be derived that

which can be considered as a recurrence relation that gives

Accordingly, the general case would be

Each point could be assigned to a ring if

Hence, we would have n buckets and each point would be assigned to a bucket if it satisfies the above condition for a ring.