Algorithms HW4

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$$S.2-3) \begin{cases} 1 & 1/6 \\ 2 & 1/6 \end{cases} \quad EDJ = (6+5+4+3+2+1)/6 = \frac{7}{2}$$

$$X = \begin{cases} 3 & 1/6 \\ 4 & 1/6 \end{cases} \quad \therefore \sum_{i=1}^{n} E[X] = n \cdot \frac{7}{2} = \frac{70}{2}$$

$$5 & 1/6 \\ 6 & 1/6 \end{cases}$$

$$E[X] = \sum_{i=1}^{n-1} \sum_{j=1}^{n} E[X_{ij}]$$

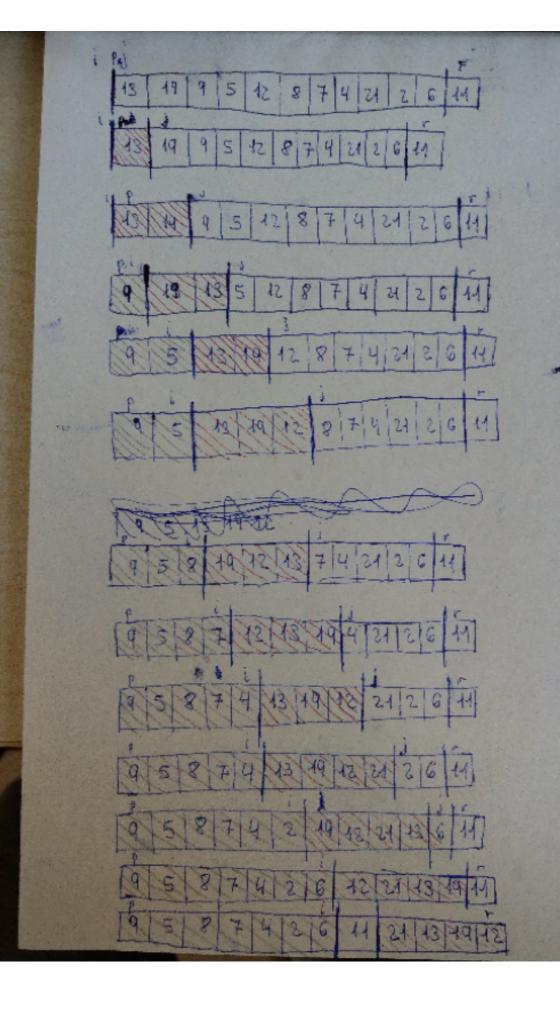
$$= (n-1) \cdot [(n-1) + (n-2) + ... + 1] \cdot E[X_{ij}]$$

$$= \frac{(n-1) \cdot (n-1+1)}{2} \cdot E[X_{ij}]$$

$$= \frac{n \cdot (n-1)}{2} \cdot \frac{1}{2}$$

Given 2 random numbers, probability that the first is greater than the second is 1/2. : Pr(X = 1) = 1/2

Hence E[xy]= + 1/2+ 0- 1/2= 1/2



Hence
$$E[N] = \sum_{i=1}^{N} i \cdot (1 - \frac{1}{N})^{2} \cdot (\frac{1}{N})^{2}$$

$$= \frac{1}{N} \cdot \frac{1}{(1 - (1 - \frac{1}{N}))^{2}}$$

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The its stage consist of the town searches after the (i-1)st find until the ith find.

Let No 1 = the # of searches at it stage

$$E[N_i] = \frac{0}{0 - c + \lambda}$$

Hence,

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5-2.9) count = 0 S = array filled with scrop of size A. length while count != A.lenth:

i = random Index (A)

if A[i] == x: return 6

if S[0 == 0:

S[1]= 1

count ++

return (x not in A)

5-2. b) N:= random variable denoting the number of searches required

ECMJ= 2 i. Pr (i iterations required)

= 1 . 2

=1

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8.4-4) To abtain O(n) performance,

bucket-sort must be applied.

Let: $T = \sqrt{n}$ $C_0 = \{(x,y) \mid x_{-1} \le x^2 y^2 \le n \}$,

for (x,y) = (x,y) = (x,y)

The ci regions partition the circle into n parts of equal area, being each a bucklet. Since the points are uniformly distributed and each region has equal area, bucklet-sort will run on O(n)

BucketSort (A)

n = A.length

B = [0]+n

for i=0 to n-1:

BED = [] #Crente list

For i=1 to n:

BEJ. append(A[J]), where

(j-1)/n <= AEJX** + AEJY*< in

for i=0 to n-1:

sort (BED)

return B[0]+BED+...+BEN-1]