**BLG335E, Analysis of Algorithms I, Fall 2015 Project 2**

**Part A**

1. X is the number of customers who gets the right hat. The probability for one customer to get his own hat back is

E[Xi] = 1/n

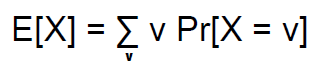
Hence, E[X] = E [∑ Xi ] from 1 to n is equal to n\*1/n which is 1. That means, it is expected that 1 customer gets his hat back.

1. X is the total time that Alice spent to get to safety and it is at least 2. We can say that

E[X1] = 2 the case which first door is chosen

E[X2] = 3 + E[X] the case which second door is chosen

E[X3] = 5 + E[X] the case which third door is chosen



And since the probability for choosing one of the doors is 1/3 then,

E[X] = (1/3)\*2 + (1/3)\*(3+ E[X]) + (1/3)\*(5+ E[X])

E[X] = 10/3 + (2/3)\* E[X]

E[X] = 10

That means, Alice is expected to spend 10 hours to get to safety.

2. If k is assigned to a value closer to n, the chance of hiring the best person would increase but in exchange amount of interviews increase as well. If k is assigned to a smaller value then the chance of hiring the best person would decrease but the number of interviews decrease, also.
3. Because that is the strategy for minimizing the amount of interviews. We will never be able select a person from i=1 to i=k. We eliminating these ones. So we have to be careful with the range. We’d like to determine the chance of finding best person for every k value. It is calculated in the next question that the best k value should be n/e.
4. *Si =*{*Bi* ∩ *Oi*}
5. If we take the first derivative of the expression and set to 0

(1/n)\*(ln n – ln k – 1) = 0

* (ln n – ln k – 1) = 0
* ln n – ln e = ln k
* k = n/e

**Part B**

2-

For line 1:

|  |  |  |  |
| --- | --- | --- | --- |
| k | 2 | N/e(4) | 8 |
| The best applicant index | 4 | 8 | 10 |
| Applicant score | 9 | 10 | 5 |
| Running time | 0 | 0 | 0 |

For line 2

|  |  |  |  |
| --- | --- | --- | --- |
| k | 2 | N/e | 8 |
| The best applicant index | 10 | 10 | 10 |
| Applicant score | 6 | 6 | 6 |
| Running time | 0.001 | 0.001 | 0.001 |

For line 3

|  |  |  |  |
| --- | --- | --- | --- |
| k | 2 | N/e | 8 |
| The best applicant index | 6 | 6 | 10 |
| Applicant score | 10 | 10 | 8 |
| Running time | 0 | 0 | 0 |