## 0.1 Tutorial 4 - Randomized algorithm

1. (a) probability that you hire exactly one person

$$\begin{split} P(\text{one person}) &= \sum_{i=1}^n \frac{1}{i} \\ &= O(n \log n) \end{split}$$

correct answer:  $\frac{1}{n}$ 

(b) probability that you hire exactly n person

$$\begin{split} P(\mathbf{n} \text{ person}) &= \prod_{i=1}^n \frac{1}{i} \\ &= \frac{1}{n!} \end{split}$$

2. Let  $x_i = 1$  when the hat is correct

$$\begin{split} E[x_i] &= P[x_i] \\ &= \frac{n-i}{n} & \text{correct answer: } \frac{1}{n} \\ E[x] &= \sum_{i=1}^n E[x_i] \\ &= O(n\log n) & \text{correct answer: } 1 \end{split}$$

3. Let  $x_{i,j} = 1$  when A[i] > A[j]

$$E[x_{i,j}] = \frac{1}{2}$$

$$E[x] = \frac{\binom{n}{2}}{2}$$

$$= \frac{n(n-1)}{4}$$

1