

Exercises on Feb 14th

CS355/555 Probability and Statistics

~~ab A B c def~~

26!

Please do your best to respond to each of the following questions within a 10-minute time-frame:

$$\underline{52} - 4 = \underline{48}$$

8

1. Passwords are chosen from a set of symbols containing 26 lowercase letters and 26 uppercase letters. $\underline{\underline{(26)} \underline{(26)} \underline{(f8)} 8!}$

(a) How many possible passwords are there if the password has exactly 8 characters, with at least two uppercase letters and at least two lowercase letters, without repeating characters? $\underline{\underline{(26)} \cdot \underline{(26)} \underline{(t4)} 8!}$

(b) How many passwords are possible if the length of the password is 8 characters, must begin with an uppercase letter, end with a lowercase letter, with repeating characters allowed? $\underline{\underline{26}} \underline{\underline{51}} \underline{\underline{52}} \underline{\underline{53}} \underline{\underline{54}} \underline{\underline{55}} \underline{\underline{56}}$ $26^2 \underline{\underline{52^6}}$

2. Let X be a uniformly distributed discrete random variable in the range $[0, 104]$.

(a) What is $E[X]?$ $= \frac{0+104}{2} = 52$; $E[X] = \sum x P(x)$

(b) Simulate $E[X^{100}]$. Write pseudo-code.

result = 0,
for i = 1 to 10000,
randomly sample x from [0, 104],
result = x^{100} + result,
end for
 $E[X^{100}] \sim \frac{\text{result}}{10,000}$,

3. For any set A and B, prove $(A \cap B)^c = (A^c \cap B) \cup (A^c \cap B^c) \cup (A \cap B^c)$

4. A Power Plant connects to a Substation via two transmission lines. From the Substation, three distribution lines link to a Factory.

Line X (Power Plant to Substation) operates with probability 0.85.

Line Y (Power Plant to Substation) operates with probability 0.75.

Line P (Substation to Factory) operates with probability 0.9.

Line Q (Substation to Factory) operates with probability 0.8.

Line R (Substation to Factory) operates with probability 0.7.

What is the probability that there is at least one functioning path from the Power Plant to the Factory? (All lines are independent!)

Good luck!

