ENGINEERING PROBABILITY

HOMEWORK # 2:
Posted on 01/31/2018

Please work out the (10) problems stated below – BT refers to the text: D.P. Bertsekas and J.N. Tsitsiklis, Introduction to Probability (Second Edition), Athena Scientific (2008). Problem **1.55** (BT) refers to Problem 55 for Chapter 1 of BT (to be found at the end of Chapter 1). Answers to the problems in BT can be found at `http://www.athenasc.com/probbook.html`.

1.

In a very distant future, M men and W women have signed up to take ENEE 324 taught by Professor Likely S. Uncertain. The assigned classroom has exactly $M+W$ seats which are arranged in a circle.

1.a If each student has found a seat before Professor L.S. Uncertain walks in, count the total number of possible seating arrangements.

1.b In how many of these arrangements will the women be seated contiguously?

2.

Problem **1.56** (BT)

3.

Problem **1.57** (BT)

4.

Problem **1.62** (BT)

5.

Consider a scenario where fourteen balls are dropped into six distinct boxes, labelled $i = 1, \ldots, 6$. Let N_i denote the number of balls which land in box i. How many distinct configurations $(N_1, \ldots, N_6)$ can be realized?

6.

On a recent voyage of a cruise ship, the captain requested that all R passengers onboard be listed with their birthday. Assuming that there are 365 days in the year, the captain would have had in her hands one of 365^R possible such lists – Why?

6.a Assume $R \leq 365$. In how many of these lists would the R passengers all have different birthdays?

6.b Assume $R \leq 365$. In how many of these lists would exactly two passengers be born on January 1, and the remaining passengers (which are therefore not born on January 1) would all have different birthdays?

7.

With Ω an arbitrary set, let $\{A_k,\ k = 1, 2, \ldots\}$ denote a countably infinite collection of subsets of Ω. Assume that for each $n = 1, 2, \ldots$, the set

$$\cap_{k=1}^{n} A_k = A_1 \cap \ldots \cap A_n$$

is not empty. Is it always the case that the set $\cap_{k=1}^{\infty} A_k$ is also not empty? Explain your answer: If it always non-empty, prove it. Otherwise give a counterexamle.

8.

How many three-digit even numbers can be formed from the digits 1, 5, 6 and 8 with no digit repeated?

9.

A public opinion poll (circa 1850) consisted of the following three questions:

1. Are you a registered Whig?
2. Do you approve of President's Fillmore's performance in office?
3. Do you favor the Electroral College system?

A group of 1000 people is polled; answer to each question is either "Yes" or "No." It is found that

1. 550 people answer "Yes" to the third question and 450 answer "No."
2. 325 people answer "Yes" exactly twice; i.e., their responses contain two "Yes" and one "No."
3. 100 people answer "Yes" to all three questions.
4. 125 registered Whigs approve of Fillmore's performance.

Question: How many of those who favor the Electroral College system do not approve of Fillmore's performance, and in addition are not registered Whigs? [**HINT:** Draw a venn diagram].

10.

A student takes an examination that contains twenty true/false questions. Find out how many ways she can answer

10.a if she marks half the questions true and half the questions false.

10.b if she marks no two consecutive answers the same.
