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CS 109, pset 1

Appendix #1

This document serves as a supplement to main pset 1 files and contains two main blocks of additional information designed to aid in mastering the topic:

- **Useful Examples from Lectures**: Links to practical tasks from lecture videos that are not covered in the Course Reader (or not covered in as much detail). These examples provide a broader and clearer understanding of the studied topics

- **Own Task Examples**: An alternative approach to practicing the material, where instead of solving pre-provided problems, you create your own tasks based on the mentioned areas

1   Useful Examples from Lectures

* The first two lectures align closely with the corresponding sections of the Course Reader, and both cover the topics thoroughly. However, in the third lecture, where probability is introduced, there are several examples in the video lectures that are not included in the Course Reader. These examples provide a more practical and hands-on understanding of the theoretical concepts discussed in the Reader.

1. Other ways to make a Sample Space discussion from Lecture 3

   Gives a clear understanding why a correct construction of a sample space is crucial

2. Pigs and cows example from Lecture 3

   The main take away - **make your indistinct items distinct**, to get to equally likely sample space outcomes, and use counting. It is up to you to make objects ordered or unordered

3. Straight poker hands example from Lecture 3

   A solid multi-step experiment with non-trivial moves

4. Chip defect detection example from Lecture 3

   Another solid multi-step experiment example, and then description of a more creative, thoughtful, and mindful alternative approach

2   Own Task Examples

1. A group of 10 friends decided to meet up and booked a table with 10 seats. In how many ways can they be seated under the following conditions?

   a. There is one couple, Alex and Amy, who insist on sitting together.
   b. In addition to Alex and Amy, there is a love triangle involving Bob, Martin, and Luci, and they should not sit next to each other under any circumstances.
   c. All 10 friends are 5 couples, and each couple wants to sit with their partner.

2. Niko is a football manager with a squad of 20 players: 15 home players and 5 foreign players. He needs to choose a starting lineup of 11 players. How many options does he have if the lineup must include no more than 3 foreign players?

3. John works at a zoo and is responsible for feeding the lions, tigers, and hyenas. Every morning, he provides the following amounts of meat:

   - Lions: 15 kg of beef and 10 kg of chicken,
   - Tigers: 10 kg of beef and 5 kg of chicken,
   - Hyenas: 5 kg of beef and 5 kg of chicken.

   Today is a lucky day, and John was given 40 kg of beef and 25 kg of chicken and he wants to distribute additional beef and chicken among the three animal groups (the distribution must be in whole kilograms, integral units). In how many ways can he distribute the additional meat?

4. A biathlete is shooting at targets. The probability of a failure (missing the target) for the first shot is 0.5. If he misses a shot, the probability of failure for the next shot increases by 10%. If he hits a shot, the probability of failure for the next shot decreases by 10%. The biathlete misses his first two shots. What is the probability that he will successfully hit the remaining three targets?