Mathematical Statistics

MAS 713

Tutorial about Chapter 2

Exercise 1

Example

A fair die is cast until a 6 appears.
What is the probability that it must be cast more than five time?

Exercise 2

Example

Among the students taking the engineering program, there are:

1. Four boys enrolled in the civil engineering program,
2. Six girls enrolled in the civil engineering program,
3. Six boys enrolled in the electrical engineering program.

How many girls must be enrolled in the electrical engineering program if gender and engineering program are to be independent when a student is selected at random ?

Exercise 3

You are imprisoned in a dungeon together with two fellow prisoners. You are informed by the jailer that one of you has been chosen at random to be hanged, and the other two are to be freed.
You ask the jailer to tell you privately which of your fellow prisoners will be set free, claiming that there would be no harm in sharing this information, since you already know that at least one of them will go free.

a) The jailer refuses to answer the question, pointing out that if you knew which of your fellows were to be set free, then your own probability of being executed would rise from $1/3$ to $1/2$, since you would then be one of two prisoners. Show that the jailer is wrong.

b) You convince the jailer, and he tells you which of the other two will be set free. You say this information to your fellow prisoners, and while the spared guy is jumping for joy, the other one asks you to switch your identities. Would you accept?

Exercise 4

Example

Suppose that 5% of men and 0.25% of women are color-blind. A person is chosen at random and that person is color-blind.

What is the probability that the person is male?

Exercise 5

Example

A box contains 3 white balls and 2 red balls. We remove at random and without replacement two balls in succession.

What is the probability that the first removed ball is white and the second is red?

Exercise 6

Example

- Machines A and B produce 10% and 90% respectively of the production of a component intended for the motor industry.
- From experience, it is known that the probability that machine A produces a defective component is 0.01 while
the probability that machine B produces a defective component is 0.05.

If a component is selected at random and is found to be defective, find the probability that it was made by machine A?