

TD 3

Exercise 1 Let A, B, C be three events, represent the following events:

- 1) At least one of the events A and B occurs.
- 2) Events A and B occur.
- 3) Exactly one of events among A and B occurs.
- 4) None of the events A and B occurs.
- 5) At least one of the events A, B and C occurs.
- 6) Exactly one of the events A, B and C does not happen.
- 7) None of the events A, B and C happens.

Exercise 2 In a tarot deck, we isolate the 21 trumps numbered from 1 to 21. We take Three trumps at random. Calculate the probability of having:

- a) At least one number that is a multiple of three.
- b) Exactly a multiple of 5 and a multiple of three.
- c) The 1st or the 21st.

Exercise 3 A coin (head or tail) and a die are tossed into the air, and we assume that the fundamental set S consists of 12 elements;
 $N = \{H1, H2, H3, H4, H5, H6, T1, T2, T3, T4, T5, T6\}$.

- 1) Determine the following events:
 $A = \{\text{head and an even number occurring}\},$
 $B = \{\text{a prime number occurring}\},$
 $C = \{\text{tail and odd number occurring}\}.$
- 2) Calculate the probability of events:
A or B occurring,
B and C occurring,
Only B occurs.

Exercise 4: Tissue cultures can be infected with either fungi or bacteria. The probability of a bacterial infection is 0.08 and that of fungal infection is 0.15.

- 1) What is the probability of a simultaneous infection by bacteria and fungus in the case where:
 - a. infections are independent.
 - b. the presence of fungus prevents the development of bacterial colonies in 50% of cases.
- 2) Calculate the probability of an infection whatever the origin in both cases.

Exercise 5: A device is equipped with 3 sensors a, b, c ; let p be the probability of failure.

$p(a) = 0.15, p(b) = 0.06, p(c) = 0.08$, the failures of the three sensors are independent and the device works if at least two of the sensors work.

Let the events:

faulty.

- A: «sensor a is faulty»,
B: «sensor b is faulty»,
C: «sensor c is faulty»

- 1) Calculate $P(A \cap B \cap C)$.
- 2) Calculate the probability that the device works.
- 3) Knowing that the device is working, what is the probability that sensor c is faulty.