

Statistics I in English
Exercises from *Übungsaufgaben und*
Lösungen zu Statistik I und II
Part 1

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Exercise 1-5:

Two dice are thrown at the same time. How many different combinations of the pairs of faces may appear?

Exercise 1-6:

How many row combinations are in a bet (11) on Toto?

Exercise 1-8:

Is a single player able to perform every possible game in skat? It is assumed that a year consists of 365 days and the player completes 200 games every day.

(Skat: 32 cards, 3 players with 10 cards each and 2 cards in the skat.)

Exercise 2-1:

The random experiment "Throwing a die twice" is carried out. The events $A = \{\text{"6" at the first throw}\}$ and $B = \{\text{"6" at the second throw}\}$ are of particular interest.

- a) State the sample space S .
- b) Calculate with the help of combinatorics the number of elementary events.
- c) Define the events A and B using the elementary events.
- d) Determine the union and the intersection of the two events A and B .
- e) Display the event space, the events A and B , their union and their intersection on the Venn diagram.
- f) State an impossible event in this random experiment.
- g) Does $A \subset B$ hold?

h) Are the events A and B disjoint?

Exercise 2-2:

State the results for the following operations:
 $A \cup A, A \cap A, A \cup \emptyset, A \cap \emptyset, \emptyset \cap S, A \cup S, A \cap S, A \cap \bar{A}, A \cup \bar{A}.$

Exercise 2-7:

A, B and C , which are not disjoint, are subsets of the sample space S . By using only the signs for union, intersection, difference, complementary event and the letters for the subsets, state the following:

- a) at least one of the three subsets occurs,
- b) only A occurs,
- c) only A and B occurs,
- d) A, B and C occurs,
- e) no subset occurs,
- f) exactly one subset occurs,
- g) at most two subsets occur.

Exercise 2-9:

A company uses three different machines M_1, M_2 and M_3 . A_i denotes the event that machine M_i doesn't break down in a certain time period and the repair service doesn't have to be called. The following events are of interest:

- $A = \{\text{at least one machine doesn't break down}\}$
- $B = \{\text{no machine breaks down}\}$
- $C = \{\text{only the third machine breaks down}\}$
- $D = \{\text{all machines break down}\}$
- $E = \{\text{only one machine breaks down}\}$

1. Denote the events A) - E) only by the events A_1, A_2 and A_3 .
2. State the relation between the events.

Exercise 2-20:

The audience in a lecture is composed of 300 students:

specialisation	gender	
	male	female
economics	42	93
business studies	78	87

One student is picked randomly. State the probability, that this student is

- male?
- female?
- male and studies economics?
- female and studies business studies?
- A female student has be picked. State the probability that she studies business studies.
- A student studying economics has been picked. State the probability that it is a male student.

Exercise 2-22:

In a German town, there are three kinds of public transports available: S-Bahn, U-Bahn and bus. The following fractions of the public make use of this offer:

$$\begin{aligned}
 P(S) &= 0.30, P(U) = 0.4, P(B) = 0.15, \\
 P(U \cup S \cup B) &= 0.01, \\
 P(U \cup S) &= 0.08, P(U \cup B) = 0.02, P(S \cup B) = 0.05.
 \end{aligned}$$

State the probability that a randomly picked person

- doesn't use the U-Bahn,
- makes use of the S-Bahn or the bus,
- doesn't make use of the public transport at all,
- uses at most two kinds.

Exercise 2-24:

There are two different newspaper (Z_1 and Z_2) available at the news agents in a small town. 60% of the inhabitants read Z_1 , 80% read Z_2 and 10% don't read any of the two newspapers. State the probability that a randomly pickted inhabitant

- a) reads both newspapers,
- b) reads Z_1 , but not Z_2 ,
- c) reads Z_2 , but not Z_1 ,
- d) reads at most one newspaper,
- e) doesn't read Z_1 .

Exercise 2-29:

There are four equally sized stripes of paper in an urn. Each of them is labeled with one of the following number codes: 110, 101, 011 and 000, whereas each stripe has a different label. A stripe is picked randomly and the following events are considered:

- A_1 = The chosen strip is labeled with a 1 at the first position
- A_2 = The chosen strip is labeled with a 1 at the second position
- A_3 = The chosen strip is labeled with a 1 at the third position

- a) Are the events in their entirety independent?
- b) Are the events pairwise independent?

Exercise 2-31:

An angler prefers three different lakes: The probability to catch a fish in the first lake is $2/3$, in the second lake 0.75 and in the third lake 0.8. A restaurant with a telephone can be found on every lake shore. An attractive waitress works in the restaurant near the second lake and the angler's wife prefers her husband therefore to fish on the other two lakes. The angler claims that he chooses the lakes randomly.

On a certain Sunday, he calls his wife to tell her about his catch. State the probability, that he went fishing on the second lake on that certain day.