

Chapter I

Random Events, Events Algebra

Exercises

1. 1.

A plant consists of 4 boilers, 2 turbines and 1 generator. Following events denote:

A : „The generator is working normally. “

B_k ($k = 1, 2, 3, 4$): „The boiler k is working normally“

C_i ($i = 1, 2$): „The turbine i is working normally“.

The plant can only work (denoted by the event D) if the generator, at least one boiler and at least one turbine work normally.

Using the events A , B_k ($k = 1, 2, 3, 4$) and C_i ($i = 1, 2$) describe the events D and \bar{D} .

1. 2.

Consider four machines and the following events

A : „merely one machine falls out“,

B : „at least one machine falls out.“,

C : „not less than two machines fall out“,

D : „only two machines fall out“,

E : „only three machines fall out“,

F : „all machines fall out“,

E_i : „the machine i falls out ($i = 1(1)4$)“.

1. Using E_i , ($i = 1(1)4$) describe the events A - F .

2. Which of the events A - F are equivalent to the following events?

a) $A \cup B$ b) $A \cap B$ c) $B \cup C$ d) $B \cap C$ e) $D \cup E \cup F$

f) $B \cap F$

1. 3.

A die will be thrown. Consider the following events:

- A: „the die shows a 6“,
- B: „the die shows an odd number“,
- C: „the die shows at least a 4“,
- D: „the die shows at most a 3“
- E: „the die shows 2 or 4“,

1. Which of the above events is complementary to C ?
2. Which events are mutually exclusive to B ?
3. Which events form together with B and E a mutually exclusive and exhaustive system of events?

1. 4.

The three fire engines in a small town operate independently. Let $E_i, i = 1, 2, 3$, denote the event that the engine i is available when needed.

Describe the following events:

1. Two fire engines are available.
2. At least one fire engine is not available.
3. No fire engine is available.

1. 5.

Three students toss a fair coin. Let $E_i, i = 1, 2, 3$, denote the event that the student i tosses a “head”.

Describe the following events:

1. At most one student tosses a “tail”.
2. All three students toss a “head”.
3. Student 2 does not toss a “head”.

1. 6.

Two coins are tossed. Describe the sample space.

1. 7.

Two students are randomly selected from a statistics class, and it is observed whether or not they suffer from math anxiety.

1. List all the possible outcomes.
2. Describe all the outcomes indicated in each of the following events. Indicate which are simple and which are compound events:
 - a) Both students suffer from math anxiety.
 - b) Exactly one student suffers from math anxiety.
 - c) The first student does not suffer and the second suffers from math anxiety.
 - d) None of the students suffers from math anxiety.

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