Implementation of DBMS
Exercise Sheet 1
Klingemann, WS 2025 / 2026

1) We have a uniformly distributed random variable X that can take integer values in the range [1, 100]. What is the mean of X?

2)
a) We have crates that can take up to 12 bottles. We have 100 bottles and want to put all of them in crates. What is the minimum number of crates that we need?
b) We have 26 bottles. Each bottle contains 2l water. We want to fill the water from all these bottles in water containers. Each water container can take up to 5l. What is the minimum number of water containers that we need?
c) We want to pack table tennis balls (diameter: 40mm) into boxes. Each ball has to be completely in one box. A box has the following dimensions: hight: 40mm, width: 40mm, length: 313mm. What is the minimum number of boxes we need to store 100 balls?

3) You have a textbook with 300 pages. You want to find information about a specific keyword. This information can be scattered in an arbitrary way throughout the book.
a) You know, that there is exactly one page that contains the information you are looking for. How many pages do you have to inspect to get all information about the keyword? Consider the minimum, maximum and mean number.
b) There can be different pages that contain information about the keyword. You do not know how many. How many pages do you have to inspect to get all information about the keyword? Consider the minimum, maximum and mean number.
c) We assume that the last page of the book contains an index that lists for different keywords all pages that contain information about the corresponding keyword. In case of the keyword, we are interested in, the index says that exactly the pages 53, 78 and 253 contain information about this keyword. We now want to use the index to get all information about the keyword. How many pages do you have to inspect?

4) Consider the following relations:

R:

A	**B**
a	b
c	b
d	e

S:

B	**C**
b	c
f	a
b	d

Calculate the following relations:
a) $\pi_A(R)$
b) $\sigma_{A=d}(R)$
c) $\pi_A(\sigma_{B=b}(R))$
d) $R \times S$