

Lecture 4

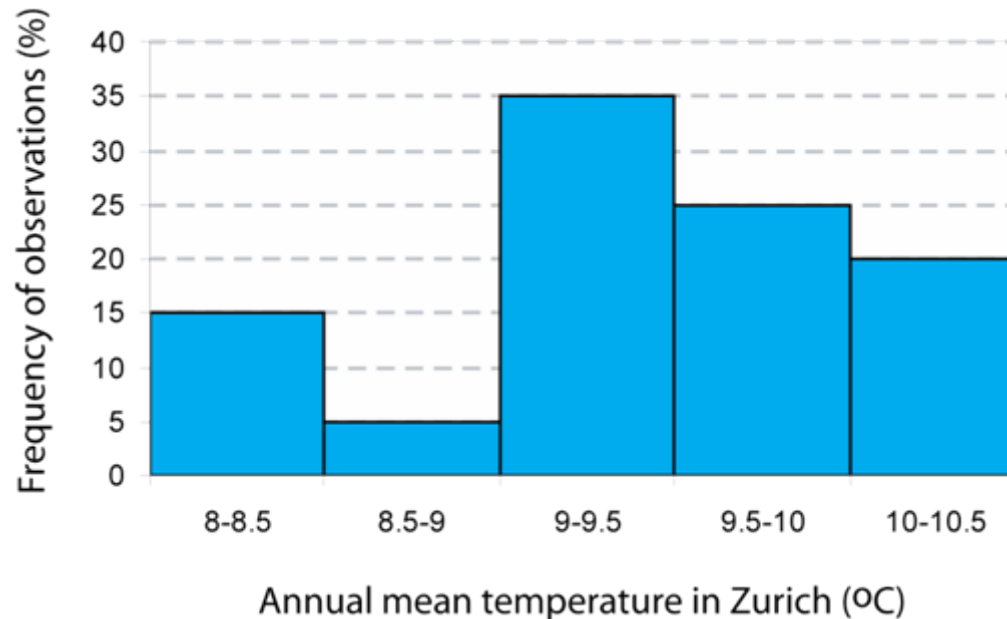
■ = 9 °C

■ = 35 %

■ $9^{\circ}\text{C} \leq \text{mode} \leq 9.5^{\circ}\text{C}$

Small Exercise_1

Measurements of the mean yearly temperature are provided for the last 20 years in Zurich. Using the data the histogram has been plotted:



Which is the value of the mode of the data set?

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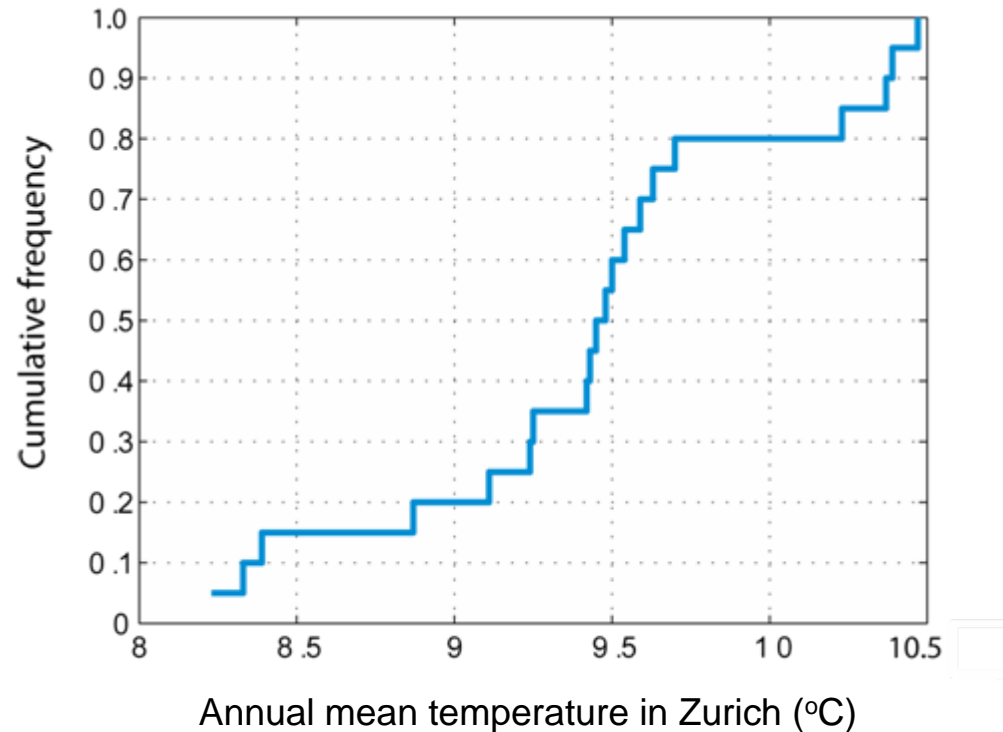
■ = 0.5

■ = 9.46 °C

■ = 9 °C

Small Exercise_2a

Also the cumulative frequency is plotted:



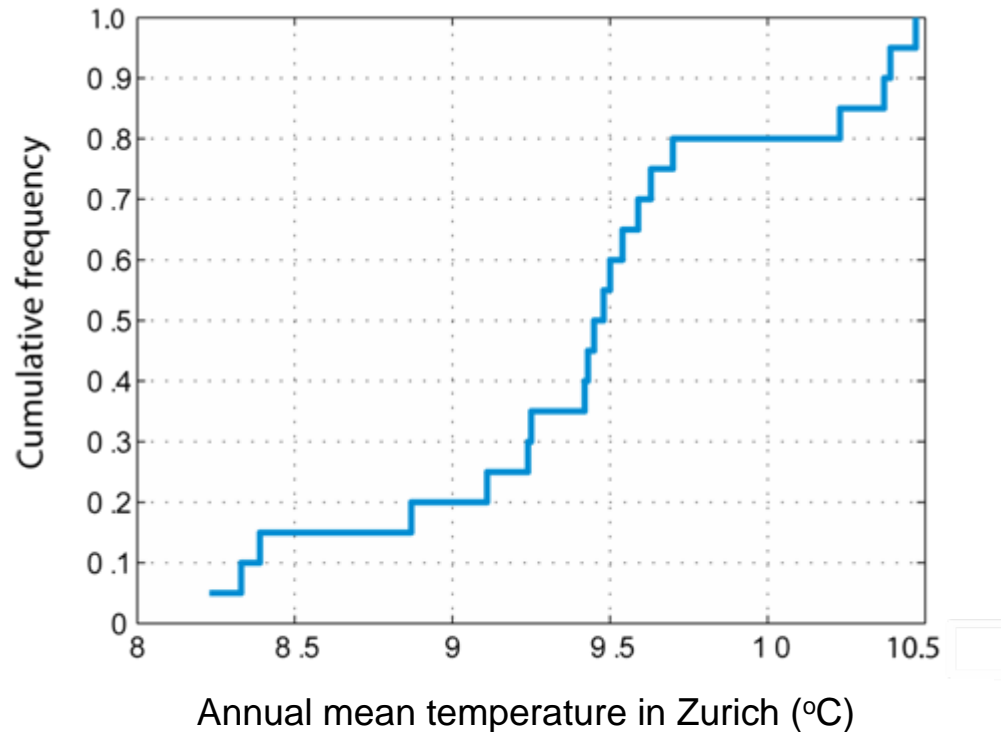
Which is the value of the median of the data set?

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Small Exercise_2b

- above 9.5 °C
- below 9.5 °C
- between 9 °C and 9.5 °C

Also the cumulative frequency is plotted:



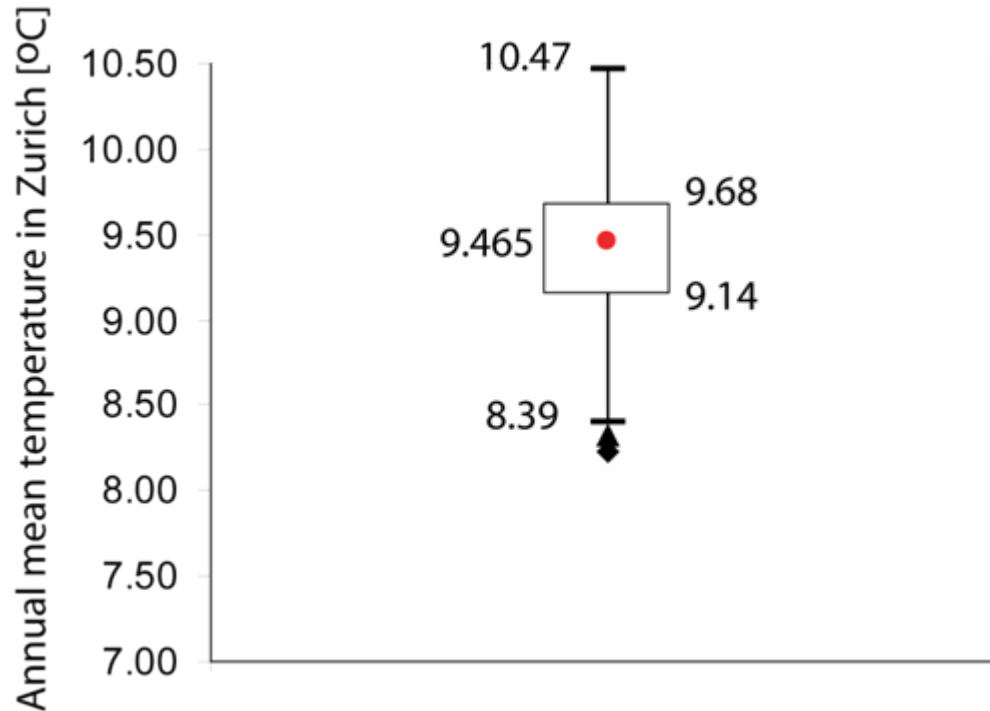
60% of the data lie.....???

Lecture 4

Small Exercise_3a

- between 9.68 °C and 9.14 °C
- equal to 9.68 °C
- below 9.68 °C

Also the Tukey box plot is plotted:



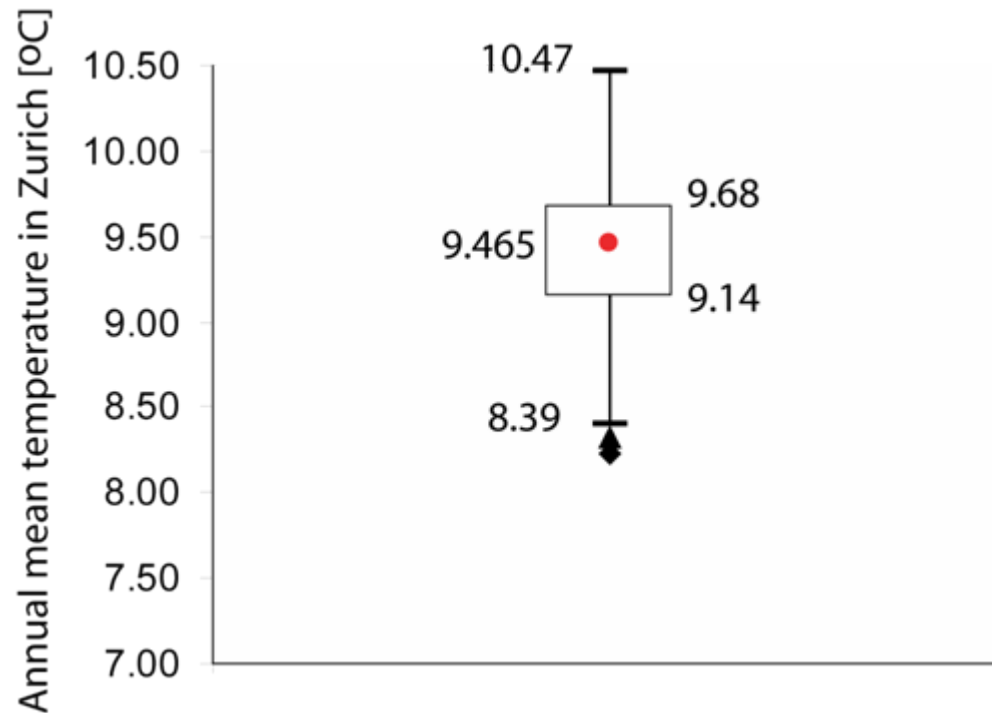
The 0.75 quantile is a value....

Lecture 4

Small Exercise_3b

■ = 0.54 °C
■ = 2.08 °C
■ = 9.465 °C

Also the Tukey box plot is plotted:



The interquartile range is equal to....??

Lecture 4

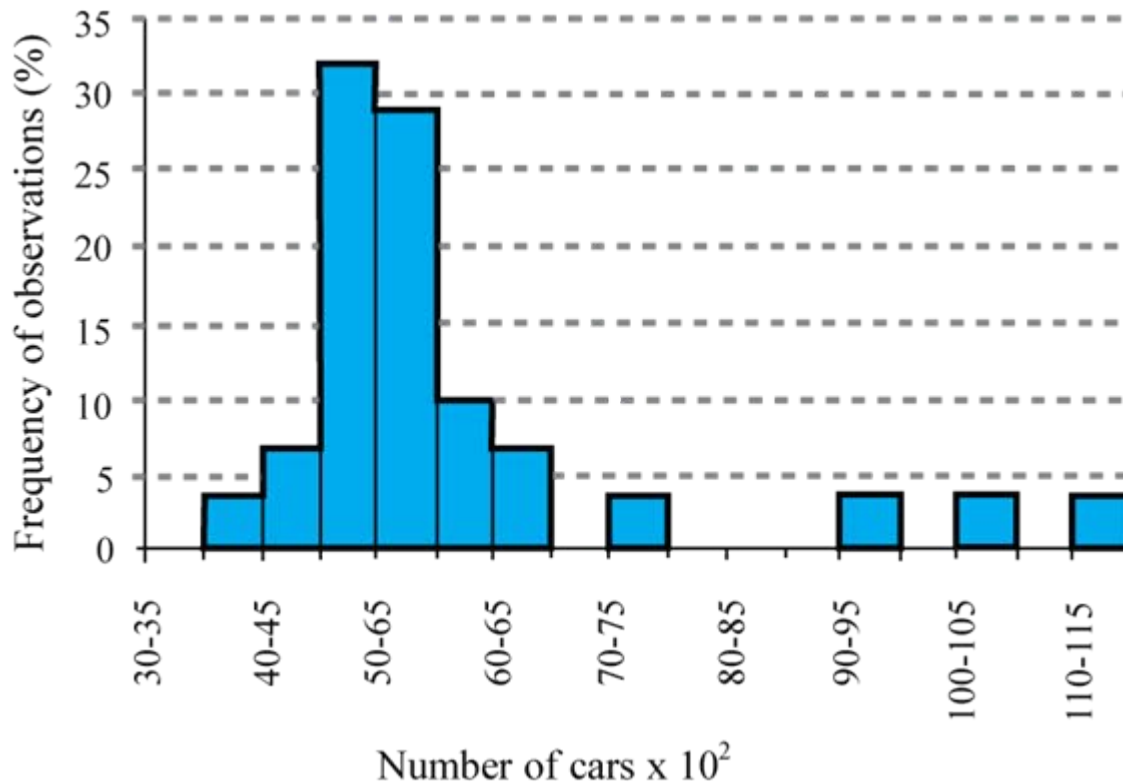
■ Positively skewed (skewed to the right)

■ Positively skewed (skewed to the left)

■ Negatively skewed (skewed to the left)

Small Exercise_4

From available observations of the traffic flow in the Gotthard tunnel the following histogram has been plotted



The distribution of the data set is??

Small Exercise 1

You are given a bag of pens and only know that the bag contains some red pens and some green pens.

You are asked to pull out a pen from the bag.

What kind of uncertainty associated with the event that a red pen is pulled out ??

Small Exercise 2

As you have seen, for a continuous random variable X , the PDF $f_X(x)$ is given in terms of the CDF $F_X(x)$ as:

$$f_X(x) = \frac{\partial F_X(x)}{\partial x}$$

Also the probability of an outcome in the interval $[x; x + dx]$ is given by: $P(X \in [x; x + dx]) = f_X(x)dx$

If we let $dx \rightarrow 0$ then we get $P(X = x) = f_X(x) \times 0 = 0$

Theoretically the implication is that the probability of a given value is zero!

Does this mean that it is actually impossible to get any single value x ??

Lecture 5

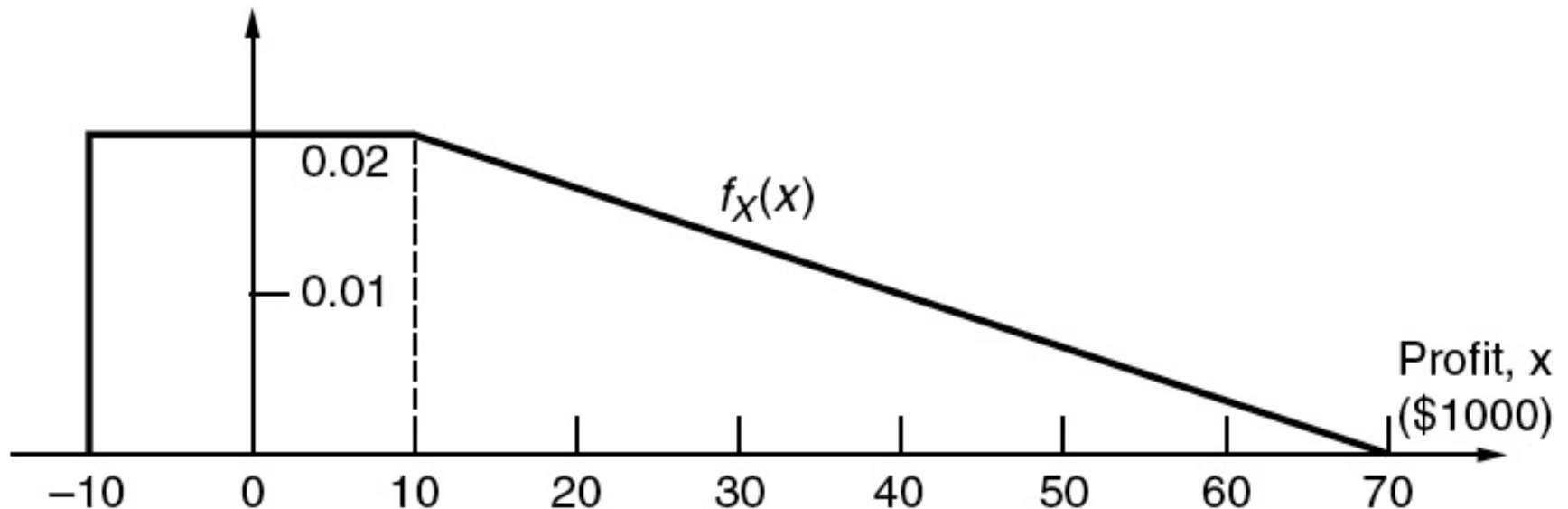
■ = 0.2

■ = 0.02

■ = 0

Small Exercise 3

The profit X earned by a contractor on a construction project is described by the following probability density function:

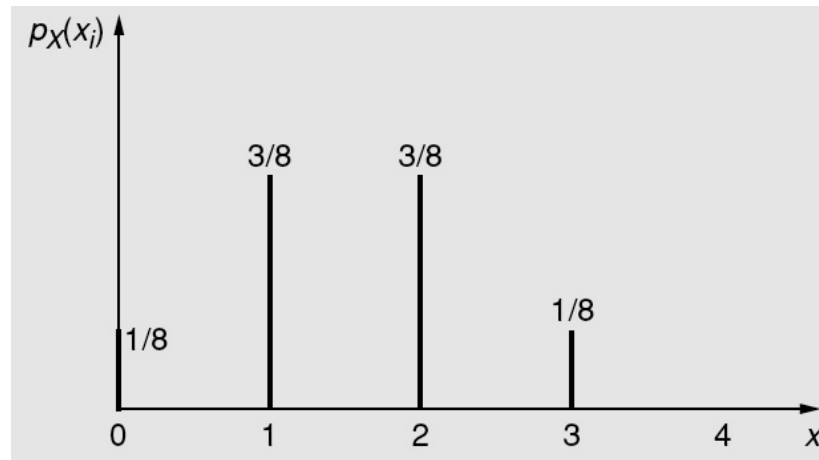


What is the probability that the contractor will lose money on this job ??

Small Exercise 4

A contractor is planning the purchase of 3 bulldozers for a new project.

The probability density function for the number of bulldozers X which break down halfway during a project is described below:



What is the expected value of the number of bulldozers which break down halfway during a project?

Lecture 6

Exercise 1- Joint probability and conditional probability

- A professor at ETH is supposed to attend SOLA. The probability that it rains on the day of SOLA is 0.7, i.e.,

$$P[W = \text{rain}] = 0.7$$

The conditional probability that he gets ill when he runs under rain is 0.8, and the conditional probability that he gets ill when he runs under no rain is 0.1, i.e.,

$$P[H = \text{ill} \mid W = \text{rain}] = 0.8$$

$$P[H = \text{ill} \mid W = \text{no rain}] = 0.1$$

What is the joint probability of the weather condition W and the health condition H of the professor, ?

$$P[W, H]$$

Lecture 6

Exercise 1- Joint probability and conditional probability

$$P[W = \text{rain}] = 0.7$$

$$P[H = \text{ill} \mid W = \text{rain}] = 0.8$$

$$P[H = \text{ill} \mid W = \text{no rain}] = 0.1$$

$$P[W, H] = ?$$

H \ W	rain	no rain
ill	0.56	0.03
no ill	0.14	0.27

H \ W	rain	no rain
ill	0.8	0.1
no ill	0.2	0.9

H \ W	rain	no rain
ill	0.07	0.08
no ill	0.56	0.92

Lecture 6

Exercise 2- Marginal probability

- What is the marginal probability of his health condition H ?

		W	
		rain	no rain
H	ill	0.56	0.03
	no ill	0.14	0.27

$$P[H = \text{ill}] = 0.59, \quad P[H = \text{no ill}] = 0.41$$

$$P[H = \text{ill}] = 0.56, \quad P[H = \text{no ill}] = 0.14$$

$$P[H = \text{ill}] = 0.70, \quad P[H = \text{no ill}] = 0.30$$

Lecture 6

Exercise 3- Geometric distribution

- The probability that a typhoon makes a landfall on an island is 0.1. What is the probability that the 10th typhoon out of a sequence is the first to make landfall on the island? Assume that the typhoon events are independent.

 0.04

 0.4


 1

Lecture 7

Small Exercise 1

- In a region, the occurrence of typhoon landfall may follow a Poisson process, the average of which is 3 in a year.

What is the probability that 3 typhoons make landfalls in that region in a year?

-  1.00
-  0.50
-  0.22


Lecture 7


Small Exercise 2

A worker has to sort out all produced pieces that do not reach the length of 1 meter.

From former experiences with the producing process, he knows that the probability of producing pieces not reaching 1 meter is $P=0.2$. He wants to test 100 pieces. What is the expected value of pieces not reaching the length of 1 meter?

 $100 \cdot 0.2$

 $\binom{100}{1} 0.2^1 (1 - 0.2)^{100-1}$

 $0.2^1 (1 - 0.2)^{100-1}$