Name:...SOLUTION...

**Instructions:** For all examples, if necessary, use a confidence level $\alpha = 5\,\%$.

Data: File Chemical process.sta from the program *Statistica*. It is available via File\Open Examples from the folder Datasets.

1. Students wrote a test of math and the frequencies of the grades (increasing order) are: Excellent 4 times, Very Good 7 times, Good 5 times, Sufficient 3 times and Failed 1 time.

   Tasks:

   (a) Write a frequency table including absolute frequencies, relative frequencies of the grades. If applicable, state also cumulative frequencies (rel., abs.), if they have a sense in this case.

   (b) Draw an appropriate graph. What is the variable type?

   (c) Find the mode, median and the both quartiles.

x_i		m_i	p_i	F_i
Excellent	1	4	0,2	0,2
	2	7	0,35	0,55
	3	5	0,25	0,8
	4	3	0,15	0,95
Failed	5	1	0,05	1,00
		20	1,00	
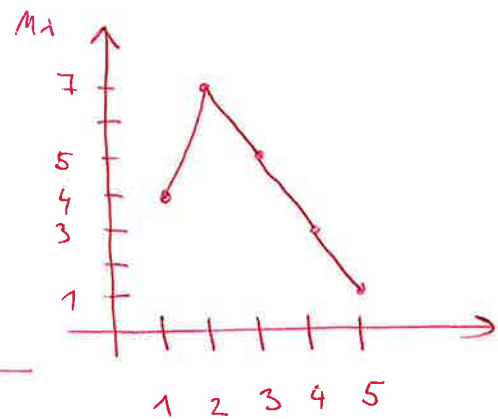
Variable is ordinal.

$$\hat{x} = \text{Very Good} = \tilde{x} = x_{0,25} \qquad x_{0,75} = \text{Good}$$

2. Let's assume that variable HCl (volume of hydrogen chloride) has a normal distribution and following sample statistics:

mean $\bar{x} = 10{,}13$, st. deviation $s_x = 1{,}42$ and count $n = 100$.

   (a) Find a left-sided confidence interval for its mean μ.

   (b) Find a right-sided confidence interval for of variance σ^2.

a) $\Delta = \dfrac{1{,}42}{\sqrt{100}} \cdot 1{,}65 = 0{,}2343$ $\mu \in \left(10{,}13 - 0{,}2343, +\infty\right) =$

$$= \left(9{,}8957 ; +\infty\right)$$

b) $\sigma^2 \in \left(-\infty; \dfrac{99 \cdot 1{,}42^2}{\chi^2_{0{,}05}(99) = \cancel{123{,}23}}\right) = \left(-\infty, \cancel{1{,}62}\right)$

$$77{,}04 \qquad 2{,}59$$

3. Write using the program *Statistica* or another software which is allowed the following percentiles:

$t-$distribution: $t_{0{,}05}(4) = -2{,}132$ $t_{0{,}99}(20) = 2{,}528$

F-distribution: $F_{0{,}95}(6,3) = 8{,}941$ $F_{0{,}01}(1,8) = 0{,}00167$

Instructions: For all examples, if necessary, use a confidence level $\alpha = 5\%$.

Data: File Chemical process.sta from the program *Statistica*. It is available via File\Open Examples from the folder **Datasets**.

1. There are frequencies of cars standing on a school parking:

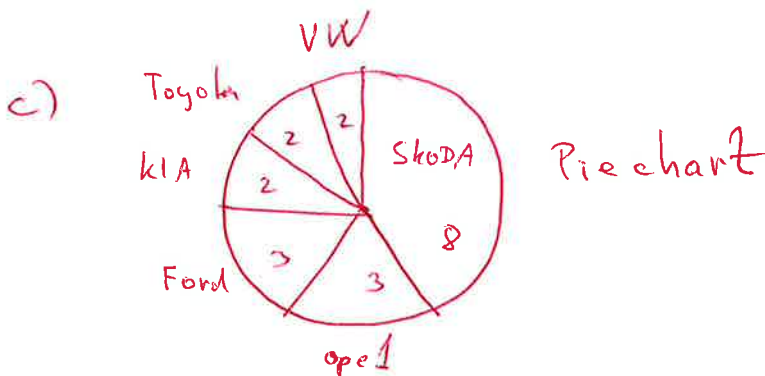   Skoda 8, VW 2, KIA 2, Opel 3, Toyota 2, Ford 3.

   Tasks:

   (a) What is the variable type? Write a frequency table.

   (b) Measure its variability.

   (c) Draw a graph.

a) Nominal.

x_i	m_i	m_i^2	n_i
Ford	3	9	0,15
KIA	2	4	0,1
Opel	3	9	0,15
Skoda	8	64	0,4
Toyota	2	4	0,1
VW	2	4	0,1
	20	94	1,00

b) $M = \dfrac{20^2 - 94}{20 \cdot 19} \doteq \underline{0,805}$

$Nom\,Var = 1 - 0,235 = \underline{0,765}$

c)

Pie chart

2. Let's assume that variable H_2O (a water percentage) has a normal distribution and following sample statistics:

mean $\bar{x} = 9{,}73$, st. deviation $s_x = 1{,}55$ and count $n = 100$.

(a) Find a right-sided confidence interval for its mean μ.

(b) Find a left-sided confidence interval for of variance σ^2.

a) $\mu \in \left(-\infty \; ; \; 9{,}73 + \dfrac{1{,}55}{10} \cdot 1{,}65\right) = \left(-\infty \; ; \; 9{,}986\right)$

b) $\delta^2 \in \left(99 \cdot \dfrac{1{,}55^2}{123{,}23} \; ; \; +\infty\right) = \left(1{,}93 \; ; \; +\infty\right)$

3. Write using the program *Statistica* or another software which is allowed the following percentiles:

Normal distribution $N(2,9)$: $p_{0,15} = -1{,}1$ $p_{0,90} = 5{,}84$

χ^2- distribution: $\chi^2_{0,95}(6) = 12{,}59$ $\chi^2_{0,99}(10) = 23{,}21$