Friedrich-Alexander-Universität
Rechts- und Wirtschafts-
wissenschaftliche Fakultät

Exam Statistics (87015), summer semester 2022

Dear student,

Please mark your answers to the single-choice questions on the answer sheet on the last page in the following way: ○⊗○
If you want to correct an answer, please completely color the **wrong** answer like: ○●⊗

Please fill in your details below:

Surname : ______________________________

Name : ______________________________

Matriculation number : ______________________________

Study program : ______________________________

Room, Seat : ______________________________

Examinor : Prof. Dovern

IMPORTANT: Also mark your matriculation number on the answer sheet !

The following information may be entered by the examinor only:

Grade:

Signature examinor:

Please read these instructions carefully:

- All pages **must** remain together!
- The exam consists of 30 **single-choice questions** in total, 5 of which are related to R.
- Use the answer sheet on the last page to fill in your final answers. **Entries in the question section are not graded.**
- Write your name and matriculation number clearly on the answer sheet and additionally mark your matriculation number with crosses.
- Please use a **dark ball pen** on the answer sheet!
- The exam duration is 90 minutes.
- **Additional material allowed:**
  - Non-programmable calculator
  - A handwritten cheat sheet (two-sided) in A4 format

Good luck!

Exercise 1: Single-choice questions

Do not forget to mark your answers on the answer sheet and also fill in your name and matriculation number on the answer sheet.

Note: Exercise 1 consists of 25 questions. You can reach 1 point per question. Each question has **only one correct answer**. Mark the correct answer with a cross **on the answer sheet**. There is **no deduction of points for wrong answers**.

The random variable C describes the daily number of customers at a nail salon and is Poisson distributed with parameter $\lambda = 10$. Each treatment at the nail salon costs 45 €. At the same time the nail salon has fixed costs of 140 € per day. The daily profit of the nail salon is given by the random variable P:

$$P = a + bC$$

1.1 What is the expected value of P, $E(P)$?
(*Hint*: Think about what values a and b have in this setup.)

A 1445
B 450
C 310
D 10
E 590

A random sample of size $n = 50$ is obtained from a normally distributed population with known variance $\sigma^2 = 36$. The sample mean is $\bar{x} = 19$. Consider the null hypothesis $H_0: \mu = 17$ versus the alternative hypothesis $H_1: \mu > 17$. The test statistic is given by $t = 2.36$.

1.2 Which of the following values is the corresponding p-value?

A 1
B 0.9893
C 0.0107
D 0.9909
E 0.0091

1.3 Independent of your answer in the previous question, assume that a hypothesis test resulted in a p-value of $p=0.13$. What is the correct test decision for a signifiance level of $\alpha=5\%$?

A Do not reject the null hypothesis because $p>\alpha$.
B Do not reject the null hypothesis because $p\neq\alpha$.
C Reject the null hypothesis because $p\neq\alpha$.
D Reject the null hypothesis because $p>\alpha$.
E Reject the null hypothesis because $p<\alpha$.

1.4 Which of the following statements about a continuous random variable X is in general **not** correct?

A $F(x_0)=\int_{-\infty}^{x_0} f(x)\,dx$
B $f(x)>0$ for all $x\in\mathcal{X}$
C Values of the probability density function are not probabilities.
D $\int_{-\infty}^{\infty} f(x)\,dx=1$
E $P(X<x_0)=f(x)$

1.5 Assume a 3-from-14 lottery where a player chooses three numbers from 1 to 14 (no duplicates allowed). What is the probability to win the jackpot, i.e., the probability that the player's numbers match those produced in the official drawing?

A 0.0012
B 0.0275
C 0.0119
D 0.2143
E 0.0027

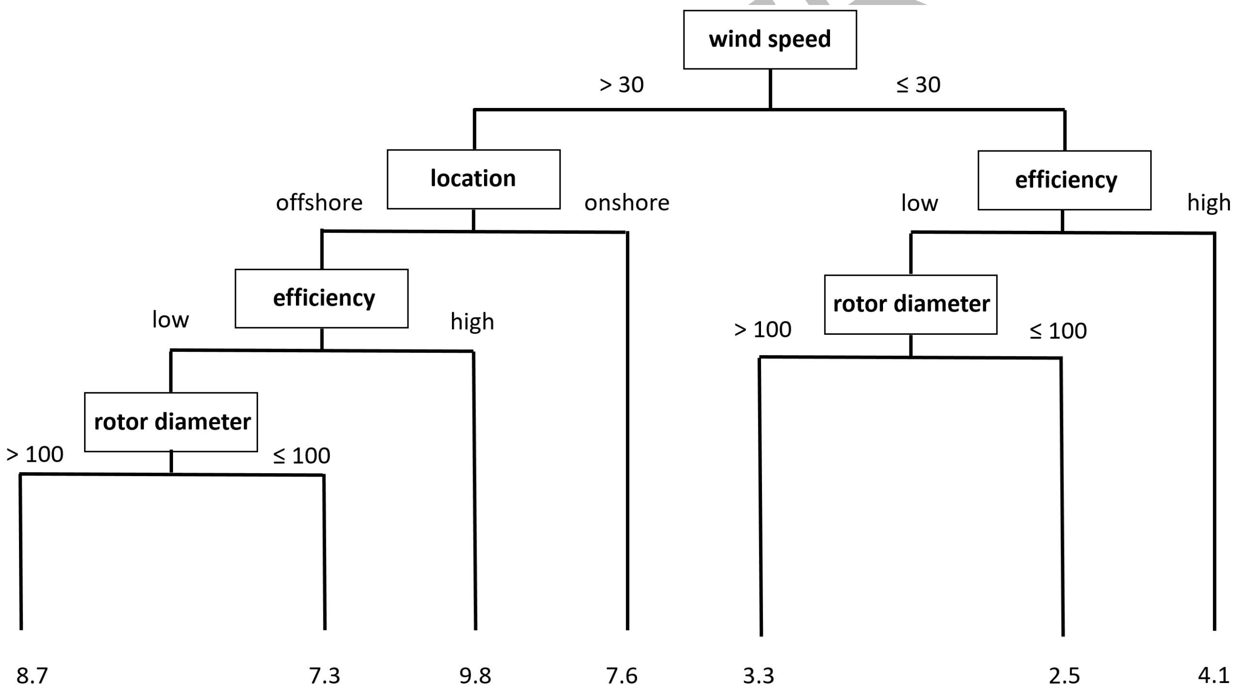
1.6 Which of the following values corresponds to a Bravais-Pearson correlation coefficient that is consistent with a highly positive linear relationship between two variables?

A -0.91
B 0.16
C 0.87
D -0.48
E 1.83

1.7 Under which condition can a researcher identify causality from correlation in an experiment?

A By allowing participants to choose if they want to join the treatment or control group.
B It is not possible to identify causality from correlation in an experiment that involves human participants.
C By assigning all participants to the treatment group.
D By assigning participants to a treatment and a control group based on a third variable such as age.
E By randomly assigning participants to a treatment and control group.

A utility owns a large wind farm with many wind turbines. The company appoints a data scientist to estimate the power production per wind turbine in mega watt (target variable) with the help of a decision tree. The data scientist uses the following features: "wind speed" (in meters per second), "location", "efficiency", and "rotor diameter" (in meters).



1.8 Which of the following statements about the given decision tree are **not** correct?

A The feature "wind speed" is the most informative feature in the given example.
B The feature "rotor diameter" only plays a role for wind turbines with low efficiency.
C The given decision tree is an example of supervised learning.
D One can expect a power production of 2.5 MW for a wind turbine that is exposed to wind speed less than 30 meters per second, with low efficiency and a rotor that is more than 100 meters in diameter.
E One can expect a power production of 7.6 MW for a wind turbine that is exposed to wind speeds of more than 30 meters per second and is located onshore.

An *i.i.d.* sample of size $n = 50$ is drawn from a normal distributed population that can be characterized by the random variable X with expected value $\mu = 15$ and standard deviation $\sigma = 4$.

1.9 What is the distribution of the sample mean?

A $\overline{X} \sim N(15, 0.08)$
B $\overline{X} \sim N(15, 0.32)$
C $\overline{X} \sim N(0.3, 16)$
D $\overline{X} \sim N(0.3, 0.08)$
E $\overline{X} \sim N(15, 16)$

Consider the experiment of selecting a card at random from a standard deck and noting its suit: clubs (C), diamonds (D), hearts (H), or spades (P). The sample space is

$$S = \{C, D, H, P\}$$

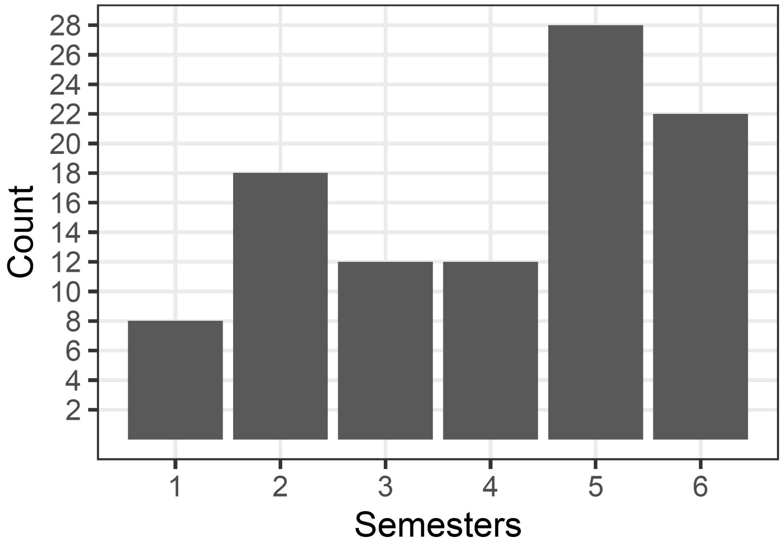
and two possible events are

$$A = \{C, D\}$$
$$B = \{D, H, P\}$$

1.10 Which of the statements about the events A and B is **not** correct?

A $\overline{A} = \{H, P\}$
B $A \cup B = S - \{D\}$
C $A \setminus B = \{C\}$
D $A \cap B = \{D\}$
E $\overline{A \cup B} = \{\varnothing\}$

A survey among 100 students resulted in the following bar graph that displays the absolute frequencies of the students' current semester:



1.11 Which of the following statements about the bar graph is **not** correct?

A The mode of the given data is 5.
B Less than half of the students studied three semesters or less.
C The share of students who are in the third semester equals the share of students who are in their fourth semester.
D 18% of the sutdents are in their second semester.
E More than 55 students are in their fifth or sixth semester.

1.12 Which of the following features of a stock portfolio is ordinal scaled?

A Purchase price
B Performance rating ("high"/"medium"/"low")
C Name of the stock
D Dividend payed ("Yes"/"No")
E Current price

The random variable X is normally distributed with unkown expected value μ and known variance $\sigma^2 = 121$. You collect an *i.i.d.* sample of size $n = 81$ and calculate the sample mean $\overline{x} = 33$.

1.13 Which of the following intervals corresponds to the two-sided 95% confidence interval for μ?

A $[6.6489, 59.3511]$
B $[30.9897, 35.0103]$
C $[30.6044, 35.3956]$
D $[31..6879, 34.3121]$
E $[19.8793, 46.1207]$

The log-likelihood function of a Poisson-distributed random variable X is given by

$$ln(L(\lambda)) = ln(\lambda)\sum_{i=1}^{n} x_i - n\lambda - \sum_{i=1}^{n} ln(x_i!)$$

1.14 Which of the following is the log likelihood estimator of λ?

A $\sum_{i=1}^{n} x_i - \sum_{i=1}^{n} \frac{1}{x_i}$
B $\frac{n}{\sum_{i=1}^{n} x_i}$
C $\sum_{i=1}^{n} x_i + n$
D $\frac{1}{n}\sum_{i=1}^{n} x_i$
E $\frac{1}{\sum_{i=1}^{n} x_i}$

Imagine you have a balcony with 8 plants. The probability that a plant survives your next holiday is 35% and independent for each plant. The random variable X describes the number of surviving plants on your balcony and is binomial distributed.

1.15 What is the probability that at least five of your plants survive your next holiday?

A 0.8939
B 0.1061
C 0.0253
D 0.9747
E 0.6250

Consider five observations x_i of a feature X:

i	1	2	3	4	5
x_i	36.8	37.0	37.4	37.7	37.9

1.16 What are the values of the median ($\tilde{x}$) and the arithmetic mean ($\bar{x}$)?

A $\tilde{x} = 37.0$, $\bar{x} = 186.8$
B $\tilde{x} = 37.0$, $\bar{x} = 37.28$
C $\tilde{x} = 37.0$, $\bar{x} = 37.36$
D $\tilde{x} = 37.4$, $\bar{x} = 37.36$
E $\tilde{x} = 37.4$, $\bar{x} = 37.28$

There are five different beer manufacturers in the city of Nuremberg (manufacturer A, B, C, D, and E). You suspect that the mean price for lager beer (μ_i with $i = A, B, C, D, E$) differs between the five manufacturers and want to test your suspicion with a hypothesis test (given a sample of prices from different shops).

1.17 How are the null hypothesis and the alternative hypothesis commonly defined in this setup?

A $H_0: \mu_i \neq \mu_j$ for at least one pair with $i \neq j$ and $H_1: \mu_A = \mu_B = \mu_C = \mu_D = \mu_E$
B $H_0: \mu_A = \mu_B = \mu_C = \mu_D = \mu_E$ and $H_1: \mu_i \neq \mu_j$ for at least one pair with $i \neq j$
C $H_0: \mu_A = \mu_E$ and $H_1: \mu_A \neq \mu_E$
D $H_0: \mu_i \neq 0$ and $H_1: \mu_i = 0$ for at least one $i = A, B, C, D, E$
E $H_0: \mu_A = \mu_B = \mu_C = \mu_D = \mu_E$ and $H_1: \mu_i \neq \mu_j$ for all $i \neq j$

The following linear transformation represents the relationship between two random variables X and Y:

$$y_i = a + b x_i$$

1.18 Which of the statements about the variable Y is **not** correct?

A $\frac{1}{n}\sum_{i=1}^{n} y_i = a + b\frac{1}{n}\sum_{i=1}^{n} x_i$

B $s_y^2 = b^2 s_x^2$

C $s_y = |b| s_x$

D $\sum_{i=1}^{n} y_i = a + \sum_{i=1}^{n} x_i$

E $\overline{y} = a + b\overline{x}$

1.19 Which of the following statements about the (weak) Law of Large Numbers (LLN) is correct?

A The LLN states that the difference between the sample mean and the true mean converges to a normal distribution as $n \to \infty$.

B The LLN states that the sample mean is normally distributed as $n \to \infty$.

C The LLN states that the difference between the sample mean and the true mean stabilizes at some value >0.01 as $n \to \infty$.

D The LLN states that the distributions of a sequence of random variables coincide as $n \to \infty$.

E The LLN states that the sample mean and the true mean coincide as $n \to \infty$.

A farmer produces vegan and dairy butter. The random variable X describes the daily vegan butter production in kg and is normally distributed with expected value $\mu = 150$ and standard deviation $\sigma = 20$. The random variable Y describes the daily dairy butter production in kg and is normally distributed with expected value $\mu = 80$ and standard deviation $\sigma = 7$. X and Y are independent from each other.
The random variable Z describes the farmer's daily total butter production in kg and is given by $Z = X + Y$.

1.20 What is the distribution of Z?

A $Z \sim N(230, 27)$

B $Z \sim N(230, 729)$

C $Z \sim N(115, 224.5)$

D $Z \sim N(115, 13.5)$

E $Z \sim N(230, 449)$

Google conducts an annual pay equity analysis among its employees. The researchers collect earnings data to analyze the direct effect of gender on annual earnings seperately for different job groups (software engineers, data scientists, ...). In 2022 the study found that Google pays men less than women in most job groups. Strikingly, the average salary of men for the whole firm was substantially higher than that of women.

1.21 What can explain this phenomenon?

A This cannot be the case, the data used in the study must be flawed.
B Simpson's paradox
C The weak law of large numbers
D Poisson's paradox
E Glivenko-Cantelli theorem

A survey asked students for their gender (feature X) and if they own a car or not (feature Y). The following contingency table displays the relative frequencies of the students' answers:

		Y	
		Car (C)	No Car ($\bar{C}$)
X	Male (M)	?	0.11
	Female (F)	0.41	0.08
	Other (O)	0.02	0.02

1.22 What is the joint frequency of owning a car and being male?

A $h(M, C) = 0.47$
B $h(M|C) = 0.47$
C $h(C, M) = 0.79$
D $h(M, C) = 0.36$
E $h(M|C) = 0.36$

1.23 What is the value of $h(C|F)$?

A 0.7900
B 0.4100
C 0.6203
D 0.5189
E 0.8367

The random variable Z describes the weight of suitcases at German airports with unknown expected value μ and unknown variance σ^2. In a job advertisement for aiport baggage handlers the employer claims that the weight of suitcases is on average 18 kg.

A worker at the company doubts that claim and wants to test it with a hypothesis test. An *i.i.d.* sample of $n = 50$ suitcases resulted in a sample mean of $\bar{x} = 18.8$ with sample variance $\hat{\sigma}^2 = 0.25$.

1.24 What is the distribution under the null hypothesis of the test statistic T in the given example?

A $T \sim t_{49}$
B $T \sim N(18.8, 0.25)$
C $T \sim N(0, 1)$
D $T \sim N(18, 0.25)$
E $T \sim t_{50}$

1.25 What is the correct test statistic for the given hypothesis test?

A $t = 11.3137$
B $t = 21.2$
C $t = 22.6274$
D $t = 80$
E $t = 265.8721$

Do not forget to mark your answers on the answer sheet and also fill in your name and matriculation number on the answer sheet.

Exercise 2: Single-choice questions about R

Do not forget to mark your answers on the answer sheet and also fill in your name and matriculation number on the answer sheet.

Note: Exercise 2 consists of 5 questions. You can reach 1 point per question. Each question has **only one correct answer**. Mark the correct answer with a cross **on the answer sheet**. There is **no deduction of points for wrong answers**.

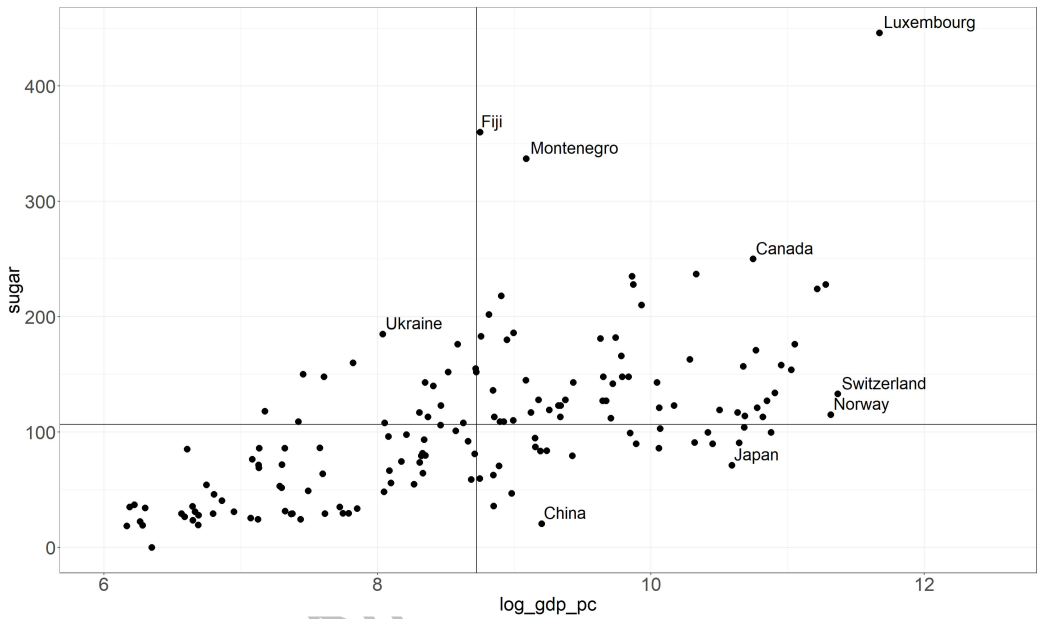
Assume a work space in R Studio for the following questions. You have one data frame called df in your environment. The data frame contains a sample of $n = 156$ countries and consists of the following variables:

Row 1: Name of the country (country)

Row 2: Sugar consumption in gramms (sugar)

Row 3: Logged GDP per capita (log_gdp_pc)

Apart from the data frame df, the environment contains no other objects. The data frame contains no missing values (NAs). The *tidyverse* package is loaded. Your analyses resulted in the following scatter plot. The two lines denote the arithmetic mean of each variable, respectively. Some data points are labelled with the corresponding country name.



2.1 Which of the following statements about the data shown in the scatter plot is **not** true?

A Norway and Switzerland have above-average GDP per capita and below average sugar consumption.
B China and Japan have above-average GDP per capita and below-average sugar consumption.
C The country with the highest sugar consumption also has the highest GDP per capita.
D The covariance between sugar and log_gdp_pc is positive.
E Ukraine has the highest sugar consumption among countries with below average GDP per capita.

2.2 Complete the following code

```
ggplot(data =  df, T(x =log_gdp_pc, y = sugar)) +
    geom_U() +
    geom_V(xintercept = mean(df$log_gdp_cap)) +
    geom_hline(yintercept = mean(df$W))
```

to create a scatter plot for sugar consumption and log GDP per capita with two lines that indicate the arithmetic mean of each variable.

(*Hint*: The code should return the same scatter plot as shown above without labels for country names.)

A	**T**: axis	**U**:vpoint	**V**: hline	**W**: sugar
B	**T**: aes	**U**: point	**V**: hline	**W**: log_gdp_cap
C	**T**: df	**U**: point	**V**: vline	**W**: country
D	**T**: aes	**U**: point	**V**: vline	**W**: sugar
E	**T**: df	**U**: scatter	**V**: xaxis	**W**: sugar

2.3 Which of the following commands does not return Pearson's correlation coefficient between sugar consumption and logged GDP per capita?

A cov(df$sugar, df$log_gdp_pc) / (sd(df$sugar) * sd(df$log_gdp_pc))
B cor(df$sugar, df$log_gdp_pc)
C cov(df$sugar, df$log_gdp_pc) / (var(df$sugar) * var(df$log_gdp_pc)
D cov(df$sugar, df$log_gdp_pc) / (sqrt(var(df$sugar) * sqrt(var(df$log_gdp_pc)))
E cor(dflog_gdp_pc, dfsugar)

2.4 Complete the following code to calulate the average sugar consumption in countries where log GDP per capita is above 10.

```
df %>%
    X(log_gdp_pc > 10) %>%
    Y(Z(sugar))
```

A	**X**: select	**Y**: summarize	**Z** : mean
B	**X**: select	**Y**: mean	**Z** : summarize
C	**X**: filter	**Y**: summarize	**Z** : df
D	**X**: mean	**Y**: filter	**Z** : summarize
E	**X**: filter	**Y**: summarize	**Z** : mean

Let X denote the number of packages of an online retailer that are damaged upon arrival. X follows a binomial distribution. Quality control examines 500 packages for damages. The online retail company knows from experience that 3% of their packages arrive with a damage.

2.5 Which of the following R codes returns the median of the distribution of X?

A qbinom(p = 0.5, size = 500, prob = 0.03)
B qbinom(p = 0.03, size = 500, prob = 0.5)
C pbinom(q = 5, size = 500, prob = 0.3)
D pbinom(q = 250, size = 500, prob = 0.03)
E dbinom(x = 250, size = 500, prob = 0.3)

Do not forget to mark your answers on the answer sheet and also fill in your name and matriculation number on the answer sheet.

Distribution Tables

Standard Normal Distribution - Cumulative Distribution Function

z	0	1	2	3	4	5	6	7	8	9
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998
3.5	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998
3.6	.9998	.9998	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999
3.7	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999
3.8	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999
3.9	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

Binomial Distribution - Probability Mass Function

n	x	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50
8	0	.6634	.4305	.2725	.1678	.1001	.0576	.0319	.0168	.0084	.0039
	1	.2793	.3826	.3847	.3355	.2670	.1977	.1373	.0896	.0548	.0312
	2	.0515	.1488	.2376	.2936	.3115	.2965	.2587	.2090	.1569	.1094
	3	.0054	.0331	.0839	.1468	.2076	.2541	.2786	.2787	.2568	.2187
	4	.0004	.0046	.0185	.0459	.0865	.1361	.1875	.2322	.2627	.2734
	5	0.	.0004	.0026	.0092	.0231	.0467	.0808	.1239	.1719	.2188
	6	0.	0.	.0002	.0011	.0038	.0100	.0217	.0413	.0703	.1094
	7	0.	0.	0.	.0001	.0004	.0012	.0033	.0079	.0164	.0313
	8	0.	0.	0.	0.	0.	.0001	.0002	.0007	.0017	.0039
9	0	.6302	.3874	.2316	.1342	.0751	.0404	.0207	.0101	.0046	.0020
	1	.2985	.3874	.3679	.3020	.2253	.1556	.1004	.0605	.0339	.0176
	2	.0629	.1722	.2597	.3020	.3003	.2668	.2162	.1612	.1110	.0703
	3	.0077	.0446	.1069	.1762	.2336	.2668	.2716	.2508	.2119	.1641
	4	.0006	.0074	.0283	.0661	.1168	.1715	.2194	.2508	.2600	.2461
	5	0.	.0008	.0050	.0165	.0389	.0735	.1181	.1672	.2128	.2461
	6	0.	.0001	.0006	.0028	.0087	.0210	.0424	.0743	.1160	.1641
	7	0.	0.	0.	.0003	.0012	.0039	.0098	.0212	.0407	.0703
	8	0.	0.	0.	0.	.0001	.0004	.0013	.0035	.0083	.0176
	9	0.	0.	0.	0.	0.	0.	.0001	.0003	.0008	.0020
10	0	.5987	.3487	.1969	.1074	.0563	.0282	.0135	.0060	.0025	.0010
	1	.3151	.3874	.3474	.2684	.1877	.1211	.0725	.0403	.0207	.0098
	2	.0746	.1937	.2759	.3020	.2816	.2335	.1757	.1209	.0763	.0439
	3	.0105	.0574	.1298	.2013	.2503	.2668	.2522	.2150	.1665	.1172
	4	.0010	.0112	.0401	.0881	.1460	.2001	.2377	.2508	.2384	.2051
	5	.0001	.0015	.0085	.0264	.0584	.1029	.1536	.2007	.2340	.2461
	6	0.	.0001	.0012	.0055	.0162	.0368	.0689	.1115	.1596	.2051
	7	0.	0.	.0001	.0008	.0031	.0090	.0212	.0425	.0746	.1172
	8	0.	0.	0.	.0001	.0004	.0014	.0043	.0106	.0229	.0439
	9	0.	0.	0.	0.	0.	.0001	.0005	.0016	.0042	.0098
	10	0.	0.	0.	0.	0.	0.	0.	.0001	.0003	.0010
15	0	.4633	.2059	.0874	.0352	.0134	.0047	.0016	.0005	.0001	0.
	1	.3658	.3432	.2312	.1319	.0668	.0305	.0126	.0047	.0016	.0005
	2	.1348	.2669	.2856	.2309	.1559	.0916	.0476	.0219	.0090	.0032
	3	.0307	.1285	.2184	.2501	.2252	.1700	.1110	.0634	.0318	.0139
	4	.0049	.0428	.1156	.1876	.2252	.2186	.1792	.1268	.0780	.0417
	5	.0006	.0105	.0449	.1032	.1651	.2061	.2123	.1859	.1404	.0916
	6	0.	.0019	.0132	.0430	.0917	.1472	.1906	.2066	.1914	.1527
	7	0.	.0003	.0030	.0138	.0393	.0811	.1319	.1771	.2013	.1964
	8	0.	0.	.0005	.0035	.0131	.0348	.0710	.1181	.1647	.1964
	9	0.	0.	.0001	.0007	.0034	.0116	.0298	.0612	.1048	.1527
	10	0.	0.	0.	.0001	.0007	.0030	.0096	.0245	.0515	.0916
	11	0.	0.	0.	0.	.0001	.0006	.0024	.0074	.0191	.0417
	12	0.	0.	0.	0.	0.	.0001	.0004	.0016	.0052	.0139
	13	0.	0.	0.	0.	0.	0.	.0001	.0003	.0010	.0032
	14	0.	0.	0.	0.	0.	0.	0.	0.	.0001	.0005
	15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

Binomial Distribution - Cumulative Distribution Funcion

n	x	p = .05	.10	.15	.20	.25	.30	.35	.40	.45	.50
8	0	.6634	.4305	.2725	.1678	.1001	.0576	.0319	.0168	.0084	.0039
	1	.9428	.8131	.6572	.5033	.3671	.2553	.1691	.1064	.0632	.0352
	2	.9942	.9619	.8948	.7969	.6785	.5518	.4278	.3154	.2201	.1445
	3	.9996	.9950	.9786	.9437	.8862	.8059	.7064	.5941	.4770	.3633
	4	1.	.9996	.9971	.9896	.9727	.9420	.8939	.8263	.7396	.6367
	5	1.	1.	.9998	.9988	.9958	.9887	.9747	.9502	.9115	.8555
	6	1.	1.	1.	.9999	.9996	.9987	.9964	.9915	.9819	.9648
	7	1.	1.	1.	1.	1.	.9999	.9998	.9993	.9983	.9961
	8	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
9	0	.6302	.3874	.2316	.1342	.0751	.0404	.0207	.0101	.0046	.0020
	1	.9288	.7748	.5995	.4362	.3003	.1960	.1211	.0705	.0385	.0195
	2	.9916	.9470	.8591	.7382	.6007	.4628	.3373	.2318	.1495	.0898
	3	.9994	.9917	.9661	.9144	.8343	.7297	.6089	.4826	.3614	.2539
	4	1.	.9991	.9944	.9804	.9511	.9012	.8283	.7334	.6214	.5000
	5	1.	.9999	.9994	.9969	.9900	.9747	.9464	.9006	.8342	.7461
	6	1.	1.	1.	.9997	.9987	.9957	.9888	.9750	.9502	.9102
	7	1.	1.	1.	1.	.9999	.9996	.9986	.9962	.9909	.9805
	8	1.	1.	1.	1.	1.	1.	.9999	.9997	.9992	.9980
	9	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
10	0	.5987	.3487	.1969	.1074	.0563	.0282	.0135	.0060	.0025	.0010
	1	.9139	.7361	.5443	.3758	.2440	.1493	.0860	.0464	.0233	.0107
	2	.9885	.9298	.8202	.6778	.5256	.3828	.2616	.1673	.0996	.0547
	3	.9990	.9872	.9500	.8791	.7759	.6496	.5138	.3823	.2660	.1719
	4	.9999	.9984	.9901	.9672	.9219	.8497	.7515	.6331	.5044	.3770
	5	1.	.9999	.9986	.9936	.9803	.9527	.9051	.8338	.7384	.6230
	6	1.	1.	.9999	.9991	.9965	.9894	.9740	.9452	.8980	.8281
	7	1.	1.	1.	.9999	.9996	.9984	.9952	.9877	.9726	.9453
	8	1.	1.	1.	1.	1.	.9999	.9995	.9983	.9955	.9893
	9	1.	1.	1.	1.	1.	1.	1.	.9999	.9997	.9990
	10	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
15	0	.4633	.2059	.0874	.0352	.0134	.0047	.0016	.0005	.0001	0.
	1	.8290	.5490	.3186	.1671	.0802	.0353	.0142	.0052	.0017	.0005
	2	.9638	.8159	.6042	.3980	.2361	.1268	.0617	.0271	.0107	.0037
	3	.9945	.9444	.8227	.6482	.4613	.2969	.1727	.0905	.0424	.0176
	4	.9994	.9873	.9383	.8358	.6865	.5155	.3519	.2173	.1204	.0592
	5	.9999	.9978	.9832	.9389	.8516	.7216	.5643	.4032	.2608	.1509
	6	1.	.9997	.9964	.9819	.9434	.8689	.7548	.6098	.4522	.3036
	7	1.	1.	.9994	.9958	.9827	.9500	.8868	.7869	.6535	.5000
	8	1.	1.	.9999	.9992	.9958	.9848	.9578	.9050	.8182	.6964
	9	1.	1.	1.	.9999	.9992	.9963	.9876	.9662	.9231	.8491
	10	1.	1.	1.	1.	.9999	.9993	.9972	.9907	.9745	.9408
	11	1.	1.	1.	1.	1.	.9999	.9995	.9981	.9937	.9824
	12	1.	1.	1.	1.	1.	1.	.9999	.9997	.9989	.9963
	13	1.	1.	1.	1.	1.	1.	1.	1.	.9999	.9995
	14	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
	15	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

Musterlösung

Exam Statistics, summer semester 2022

1.1	□ A □ B ■ C □ D □ E
1.2	□ A □ B □ C □ D ■ E
1.3	■ A □ B □ C □ D □ E
1.4	□ A □ B □ C □ D ■ E
1.5	□ A □ B □ C □ D ■ E
1.6	□ A □ B ■ C □ D □ E
1.7	□ A □ B □ C □ D ■ E
1.8	□ A □ B □ C ■ D □ E
1.9	□ A ■ B □ C □ D □ E
1.10	□ A ■ B □ C □ D □ E
1.11	□ A □ B □ C □ D ■ E
1.12	□ A ■ B □ C □ D □ E
1.13	□ A □ B ■ C □ D □ E
1.14	□ A □ B □ C ■ D □ E
1.15	□ A ■ B □ C □ D □ E
1.16	□ A □ B □ C ■ D □ E
1.17	□ A ■ B □ C □ D □ E
1.18	□ A □ B □ C ■ D □ E
1.19	□ A □ B □ C □ D ■ E
1.20	□ A □ B □ C □ D ■ E
1.21	□ A ■ B □ C □ D □ E
1.22	□ A □ B □ C ■ D □ E
1.23	□ A □ B □ C □ D ■ E
1.24	■ A □ B □ C □ D □ E
1.25	■ A □ B □ C □ D □ E
2.1	■ A □ B □ C □ D □ E
2.2	□ A □ B □ C ■ D □ E
2.3	□ A □ B ■ C □ D □ E
2.4	□ A □ B □ C □ D ■ E
2.5	■ A □ B □ C □ D □ E