For a statistical test of significance level α it holds

- a. rejection at level α implies rejection at level $\alpha/2$
- b. the rejection area does not depend α
- c. the rejection area shrinks when α is increased
- d. the rejection area depends on the distribution of the test statistic under the null hypothesis

Let $X_1, X_2, \ldots X_{81}$ be an i.i.d. sample from a population with population mean $\mu = 5$ and population variance $\sigma^2 = 4$ and let $S = X_1 + X_2 + \ldots X_{81}$. Approximate the probability $P(S \notin [369, 441])$ using the Central limit theorem.

- a. 5%
- b. 32%
- c. 95%
- d. 68%

Student's one-sample 99%-confidence interval is evaluated on n data and it overlaps a claimed parameter μ_0. Let q be the 99.5%-quantile of the $t(n-1)$-distribution. It holds that

- a. the distance of the mean of the data and μ_0 is smaller than $q/2$ times the standard error of the mean
- b. the expectation of the sum of two $t(n+1)$-distributed random variables equals the sum of their expectations
- c. the distance of the mean of the data and μ_0 is larger than q times the standard error of the mean
- d. the null hypothesis $H_0 : \mu = \mu_0$ of Student's (two-sided one-sample) t-test is not rejected at 5% significance level

Let X and Z be independent random variables and both $N(0, 1)$-distributed. Let

$Y := \frac{X+Z}{2}$.

Then the correlation between X and Y is

- a. 0
- b. 1/4
- c. 1/2
- d. $\sqrt{2}/2$

For a statistical test of a significance level α it always holds true

- a. the probability to commit the α-error is larger than α
- b. the power is smaller than the probability to commit the α-error or at least as large as the probability of an impossible event
- c. the probability not to commit the β-error is larger than α
- d. the probability not to commit the β-error is smaller than α

Three (fair) coins are flipped. Which R-command approximates expected number of 'successes' (e.g., heads)?

- a. sum(rbinom(1000,1,1/2) + rbinom(1000,1,1/2) + rbinom(1000,1,1/2))/3000
- b. sum(rbinom(1000,3,1/2))/1000
- c. sum(rbinom(1000,3,1/2))/3000
- d. sum(rbinom(1000,3,1/2) + rbinom(1000,3,1/2) + rbinom(1000,3,1/2))/1000

Let $\mathfrak{X} = (X_1, X_2) \sim mult(2, p)$ with $p = (1, 0)$. Which statement is **not** correct?

- a. $\mathbb{E}[X_1] = 2$ and $\mathbb{V}ar(X_1) = 0$
- b. $P(X_1 = 2) = 1$
- c. $P(\mathfrak{X} = (1, 1)) = \binom{2}{1,1}(1/2)^1 \cdot (1/2)^1$
- d. $X_1 \sim b(2, 1)$

Let X be a random variable with probability density function of the form

$$f(x) = \begin{cases} -2x, & -1 \le x \le 0 \\ 0, & \text{else} \end{cases}.$$

Compute $P(-\frac{3}{4} < X < -\frac{1}{2})$.

- a. 1/2
- b. 19/64
- c. 7/8
- d. 5/16

For (real-valued) data $x_1, \ldots, x_n$ (with $n \geq 2$) it always holds that

- a. their empirical variance is bigger than their empirical standard deviation
- b. the emprical median is not equal to the emprical mean if the data is sampled from an asymmetric distribution
- c. their empirical median is unique if the sample size is odd
- d. the empirical median equals the empirical mean if data is sampled from a symmetric distribution

The P-values of six tests are $1/25, 0.01, 1/(8\pi), 2/7^2, 0.08\%$ and $(10^{-4}/10^{-3})/3$. Consider a significance level $\alpha = 5\%$ for each test (prior Bonferroni). How often do we reject the associated null hypothesis after Bonferroni correction?

- a. thrice
- b. once
- c. four times
- d. twice

In the situation of a right-sided one-sample t-test we find $\bar{x} = -12$, $s = 21$ and $n = 49$. For a given significance level we find the rejection region $R = [2.2, \infty)$. Then for the null hypothesis $H_0 : \mu = -3$ it holds

- a. we reject H_0, and we would also reject for any larger significance level
- b. we do not reject H_0, but we would reject if only the significance level was chosen small enough
- c. we do not reject H_0, and we would also not reject for any smaller choice of the significance level
- d. we reject H_0, and we would also reject for any smaller significance level

Two features of a novel operating system are compared using a two-sample t-test. The statistics for the first feature are $\bar{x} = 15$, $s_x^2 = 55$ and $n_x = 5$ and those for the second feature are $\bar{y} = 18$, $s_y = 10$ and $n_y = 4$. The rejection region is given through $R = (-\infty, -q] \cup [q, \infty)$. Then it holds

- a. we reject for $q = 2.5$ but not for $q = 1.5$
- b. we do not reject for $q = 2.5$ but for $q = 1.5$
- c. we do neither reject for $q = 2.5$ nor for $q = 1.5$
- d. we reject for both $q = 2.5$ and $q = 1.5$

Let Z be a standard normal random variable and let $X = -4Z + 0.5$. Use the values given in the table below in order to compute $P(|X| \leq 0.5)$.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051

Table 1: Cumulative distribution function of the standard normal distribution

- a. 0.0987
- b. 0.4013
- c. 0.1915
- d. 0.1987

You perform a χ^2-test for independence in R using chisq.test(). From the output you can not read

- a. the P-value
- b. the degrees of freedom
- c. the 95%-confidence interval for the expectation
- d. the χ^2-statistic

For the P-value of a statistical test of significance level α it always holds true

- a. $P \leq \alpha,$ if the null hypothesis was not rejected
- b. $P > \alpha,$ if the null hypothesis was rejected
- c. $P \leq \alpha/2,$ if the null hypothesis was rejected
- d. $P \leq 2\alpha,$ if the null hypothesis was rejected

Five groups are compared with an ANOVA. The size of the jth group is 5 if j is even, and 25 if j is odd, for $j = 1, 2, \ldots, 5$. Let f denote the Fisher-statistic calculated on the data. The following table shows the 99%-quantiles of the $\mathcal{F}(df_1, df_2)$-distribution.

		df_1				
		4	5	6	7	8
	55	3.68	3.37	3.15	2.98	2.85
	60	3.65	3.34	3.12	2.95	2.82
df_2	65	3.62	3.31	3.09	2.93	2.80
	70	3.60	3.29	3.07	2.91	2.78
	75	3.58	3.27	3.05	2.89	2.76
	80	3.56	3.26	3.04	2.87	2.74

From the information given, we conclude that

a. For $f = 3.58$ we do reject the null hypothesis on the 1%-level, but we do not know of whether we reject it on the 5%-level

b. For $f = 3.68$ we do not reject the null hypothesis on the 1%, but we do not know of whether we reject it on the 5%-level

c. For $f = 3.58$ we do reject the null hypothesis on the 5%-level, and we know of whether we reject it on the 1%-level

d. For $f = 3.68$ we do reject the null hypothesis on the 1%-level, but we do not know of whether we reject it on the 5%-level

Suppose box A contains 4 red and 5 blue coins and box B contains 6 red and 3 blue coins. A coin is chosen at random from box A and placed in box B. Finally, a coin is chosen at random from among those that are now in box B. What is the probability a red coin was transferred from box A to box B given that the coin chosen from box B is blue?

- a. 16/45
- b. 5/8
- c. 2/9
- d. 3/8

In the context of a statistical test the null hypothesis was rejected. Which interpretation is reasonable?

- a. the data barely give us a reason to doubt the null hypothesis
- b. the null hypothesis was significant
- c. the data are compatible with the null hypothesis
- d. the data are implausible if the null hypothesis holds true

In a linear regression model ('y_i modeled as a linear function of x_i plus error') the parameters are estimated via least squares. For the mean and the empirical standard deviation of the x and y values we obtain $\bar{x} = 3, s_x = 4, \bar{y} = 7$ and $s_y = 3$. It holds that

- a. the regression line goes through $(7, 3)$
- b. the regression line goes through $(3, 7)$
- c. the slope of the regression line is smaller than $-3/4$
- d. the slope of the regression line is larger than $3/4$

A medical treatment has a success rate of 0.75. Two patients will be treated with this treatment. Assuming the results are independent for the two patients, what is the probability that at least one of them will be successfully cured?

Wählen Sie eine Antwort:

- a. 0.5625
- b. 0.4750
- c. 0.9375
- d. 0.1875