Frage 1

Bisher nicht beantwortet

Erreichbare Punkte: 5

Frage markieren

Jan wants to compute in R the probability of obtaining at least one 6 when rolling a fair dice 4 times. He should use the command

- a. dbinom(0,4,1/6)
- b. qbinom(0,4,1/6)
- c. 1-pbinom(0,4,1/6)
- d. rbinom(0,4,1/6)

c)

The chance of rolling a 6 (the chance of having a success) is 1/6. The Binomial distribution looks at the number of successes at given probability p of having a success in one try.
a) gives us the of having no successes in 4 rolls

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> (5/6)^4
[1] 0.4822531
> dbinom(0,4,1/6)
[1] 0.4822531
```

b) returns x, where likelihood of having x or less number of successes is 0.

c) 1-probability of having no successes, so it returns probability of having at least one success

d)returns vector of length 0 with number of successes in 4 random rolls.

Frage 5
Bisher nicht beantwortet
Erreichbare Punkte: 5
Frage markieren

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 larger than q 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 null hypothesis $H_0 : \mu = \mu_0$ of Student's (two-sided one-sample) t-test is not rejected at 5% significance level
- d. 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 t-distribution is symmetric.

Frage 7
Bisher nicht beantwortet
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Frage markieren

Let $X_1, X_2, \ldots X_{36}$ be an i.i.d. sample from a population with population mean $\mu = 5$ and population variance $\sigma^2 = 4$ and let $S = X_1 + X_2 + \ldots X_{36}$. Approximate the probability $P(S \notin [168, 192])$ using the Central limit theorem.

- a. 68%
- b. 45%
- c. 78%
- d. 32%

d)

$$P(X_n \cdot n \notin [168, 192]) = P(X_n \cdot n < 168) + P(X_n \cdot n > 192) =$$
$$P(X_n \cdot n < 168) + 1 - P(X_n \cdot n < 192) = P(X_n \cdot n - n \cdot \mu < -12) + 1 -$$
$$P(X_n \cdot n - n\mu < 12) = P\left(X_n - \mu < -\frac{1}{3}\right) + 1 - P\left(X_n - \mu < \frac{1}{3}\right) =$$
$$P\left(\frac{(X_n - \mu)\sqrt{n}}{\sigma} < -1\right) + 1 - P\left(\frac{(X_n - \mu)\sqrt{n}}{\sigma} < 1\right) =$$
$$1 + \phi(-1) - \phi(1)$$

Frage 9
Bisher nicht beantwortet
Erreichbare Punkte: 5
Frage markieren

Let A and B be two independent events such that P(A|B)=0.3 and P(B|A)=0.6. Compute the probability $P(A^c \cap B)$.

- a. 0.56
- b. 0.12
- c. 0.42
- d. 0.18

Meine Auswahl widerrufen

c)

$$P(A|B) = \frac{P(A)\cancel{P(B)}}{\cancel{P(B)}} = 0,3 \quad \Rightarrow \quad P(A) = 0,3$$
$$P(B|A) = \frac{P(B)\cancel{P(A)}}{\cancel{P(A)}} = 0,6 \quad \Rightarrow \quad P(B) = 0,6$$
$$P(A^c \cap B) = P(A^c)P(B) = 0,7 \cdot 0,6 = 0,42$$

Frage **10**

Bisher nicht beantwortet

Erreichbare Punkte: 5

Frage markieren

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

- a. $P \leq \alpha/2$, if the null hypothesis was rejected
- b. P always lies in the complement of $(-\infty, -1)$ regarding $\mathbb{R}$
- c. $P \leq \alpha$, if the null hypothesis was not rejected
- d. $P > 2\alpha$, if the null hypothesis was rejected

b)

The p value is a probability so it must be equal or greater than 0
The Null-hypothesis is rejected, when p-value <alpha, so c &d are false and a is not always true

Frage **11**

Bisher nicht beantwortet

Erreichbare Punkte: 5

Frage markieren

For a statistical test of significance level α it holds

- a. the rejection area depends on $1-\alpha$
- b. rejection at level α implies rejection at level $\alpha/2$
- c. the rejection area does not depend on the distribution of the test statistic under the null hypothesis
- d. the rejection area shrinks when α is increased

a)

Frage **12**

Bisher nicht beantwortet

Erreichbare Punkte: 5

Frage markieren

Two features of a novel operating system are compared using a two-sample t-test. The statistics for the first feature are $\bar{x} = 15, s_{\bar{x}}^2 = 55$ and $n_x = 5$ and those for the second feature are $\bar{y} = 21, s_y = 10$ 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 reject for both $q = 2.5$ and $q = 1.5$
- c. we do neither reject for $q = 2.5$ nor for $q = 1.5$
- d. we do not reject for $q = 2.5$ but for $q = 1.5$

d)

$\bar{x}_1 = 15$ $\qquad$ $\bar{y} = 21$

$s_{x_1}^2 = 55$ $\qquad$ $s_y = 10$

$n_x = 5$ $\qquad$ $n_y = 4$

$$S_p = \sqrt{\frac{4 \cdot 55 + 3 \cdot 100}{7}} \approx 8,6$$

$$T = \frac{15 - 21}{8,6 \cdot \sqrt{0,45}} = -1 \qquad t = 2,262$$

$\alpha = 0,05$ $\qquad$ $\cancel{P(|X| \geq |-1|) =}$

$\Rightarrow$ Acceptance region $[-2,262,\ 2,262]$

Frage **13**

Bisher nicht beantwortet

Erreichbare Punkte: 5

Frage markieren

In the context of a statistical test the null hypothesis was not rejected. Which interpretation is reasonable?

- a. the data are hardly compatible with the null hypothesis
- b. the null hypothesis is not compatible with an alternative hypothesis
- c. the null hypothesis was not significant
- d. the data barely give us a reason to doubt the null hypothesis

d)

Frage **14**

Bisher nicht beantwortet

Erreichbare Punkte: 5

Frage markieren

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

b)

$\mu > \mu_0$

$\bar{x} = -12$, $s = 21$, $n = 49$

$R = [2{,}2, \infty)$

$H_0: \mu_0 = -3$ $H_1: \mu > \mu_0$

$$T = \frac{(\bar{X}_n - \mu_0)\sqrt{n}}{s} = \frac{9 \cdot 7}{21} = 3$$

$\Rightarrow T > 2{,}2 \Rightarrow$ reject

looking for t so that $P(X > t) = \alpha$

we know for given α $t = 2{,}2$

if $\alpha^* < \alpha \Rightarrow t^* > t$

if $\alpha^* > \alpha \Rightarrow t^* < t \Rightarrow$ H_0 would also be rejected for greater significance level

Frage 15

Bisher nicht beantwortet

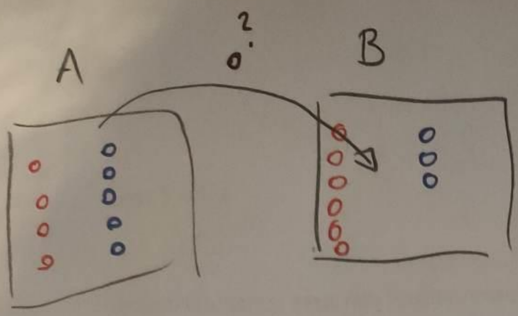
Erreichbare Punkte: 5

Frage markieren

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

a)



$$\frac{4}{9} \cdot \frac{3}{10}$$

$\cancel{P(R_8 \mid B_8)}$

$P(\text{Red transfered}) = \frac{4}{9}$

$P(\text{Blue transferred}) = \frac{5}{9}$

$P(\text{piching red}) = \frac{4}{9} \cdot \frac{7}{10} + \frac{5}{9} \cdot \frac{6}{10}$

$P(\text{piching blue}) = \frac{4}{9} \cdot \frac{3}{10} + \frac{5}{9} \cdot \frac{4}{10}$

$$\frac{P(\text{red transferred \& blue piched})}{P(\text{blue piched})} = \frac{\frac{4}{9} \cdot \frac{3}{10}}{\frac{32}{90}} = \frac{12}{32}$$

$$= \frac{6}{16} = \frac{3}{8}$$