A random sample of 101 distances has a mean 24 centimeters and a median 25 centimeters. It has just been discovered that an observation which was recorded as 35 actually had a value 30. If this correction to the data is made, then

a. the mean remains the same, but the median is decreased.

b. the mean and median are both decreased.

c. we do not know how the mean and median are affected without further calculations, but the variance is decreased.

d. the median remains the same, but the mean is decreased.

A complex electronic device contains three components A, B and C. The probabilities of failure for each component in any one year are 0.02, 0.04 and 0.07 respectively. If any one component fails, the device will fail. If the components fail independently of one another, what is the probability that the device will not fail in one year?

a. 0.875

b. 0.120

c. greater than 0.99

d. less than 0.01

Which one of the following statements about the Central Limit Theorem is correct?

a. The Central Limit Theorem states that the sample mean is equal to the population mean, provided that the sample size is large enough.

b. The Central Limit Theorem states that the sampling distribution of the population mean is approximately normal, provided that the sample size is large enough.

c. The Central Limit Theorem states that the sample mean is always equal to the population mean.

d. The Central Limit Theorem states that the sampling distribution of the sample mean is approximately normal for large sample sizes.

A random sample of 20 IQ scores of famous people was taken from the website of IQ of Famous People The data resulted in the sample mean $\bar{x} = 145.4$ and the sample standard deviation 29.2.
Compute a 90% confidence interval for the IQ of a famous person based on the given random sample.

a. (136.7, 154.1)

b. (131.7, 159.1)

c. (128.8, 162)

d. (134.1, 156.7)

Let A and B be two events such that $P(A) = 0.33$, $P(B) = 0.45$ and $P(A^c \cap B) = 0.29$.

Compute the probability $P(A|B^c)$.

a. 0.5272

b. 0.6444

c. 0.3091

d. 0.3778

The null hypothesis is not rejected in a χ^2-test for independence with the level of significance α when

a. the χ^2-statistic is larger than the critical value for the given α.

b. the p-value is smaller than $1 - \alpha$.

c. the p-value is smaller than α.

d. the χ^2-statistic is smaller than the critical value for the given α.

Let $X_1, \ldots, X_{16}$ be i.i.d. random variables with $X_1 \sim \mathcal{N}(2, 4)$. From a data set we computed the test statistics to be 4. In the context of a right-sided test, let $H_0 : \mu = 2$. If the rejection area is $R = [3, +\infty)$, which one of the following statements is correct?

a. We will commit a Type I error.

b. If we increase the significance level of the test, then we obtain a lower test power.

c. We will not commit a Type I error.

d. We will commit a Type II error.

In a two-sided one-sample t-test we have $\bar{x} = 8$, $s = 3$ and $n = 25$. For a given significance level we find the rejection region $R = (-\infty, -3.1] \cup [3.1, \infty)$. Then, for the null hypothesis $H_0 : \mu = 6$,

a. we do not reject H_0, but we would reject if the significance level were large enough.

b. we reject H_0, and we would also reject for any larger significance level.

c. we do not reject H_0, but we would reject if the significance level were small enough.

d. we reject H_0, and we would also reject for any smaller significance level.

Null and alternative hypotheses are statements about

a. sample statistics

b. it depends - sometimes population parameters and sometimes sample statistics.

c. population parameters

d. sample parameters

In a linear regression model ('y_i modeled as a linear function of x_i plus error') the parameters are estimated via least squares. An analysit studied the relationship between sales (y, in 1000 euro) and price (x, in euro) using linear regression. The regression line obtained from the study

$y = 50000 - 8 \cdot x$

implies that an

a. increase of 1 euro in price is associated with a decrease of 8000 euro in sales.

b. increase of 1 euro in price is associated with a decrease of 42000 euro in sales.

c. increase of 1 euro in price is associated with a decrease of 8 euro in sales.

d. increase of 8 euro in price is associated with an increase of 8000 euro in sales.

Let $X \sim \mathcal{N}(2,5)$ and $Y \sim \mathcal{N}(5,9)$ be two independent random variables. Compute $P(3X - 2Y \leq 5)$.

a. 0.841

b. 0.633

c. 0.941

d. 0.540

Let X_1, X_2 be a random sample from an exponential distribution $\exp(1)$, i.e. the distribution with the probability density function $f(x) = \begin{cases} e^{-x} & x \geq 0 \\ 0 & x < 0 \end{cases}$.

Let $Y = \max\{X_1, X_2\}$. Compute the probabilty $P(Y \leq \ln 4)$, where $\ln$ denotes the natural logarithm.

a. 0.5625

b. 0.9375

c. 0.0139

d. 0.4375

An unfair coin is tossed until obtaining a tail. It is known that a head is obtained four times as often as a tail. What is the probability that the coin was tossed at least five times?

a. 0.3164

b. 0.4096

c. 0.5904

d. 0.08192

Let X be a random variable with a finite nonzero variance. Which one of the following statements is true?

a. $\mathbb{V}ar(2X) = \mathbb{C}ov(2X, X)$

b. $\mathbb{C}ov(2X + 3, 2X - 3) = 4\mathbb{V}arX - 9$

c. $\mathbb{C}orr(2X, X) = 1$

d. $\mathbb{V}ar(2X - 3) = 4\mathbb{V}ar(X) + 3$

In 1000 tosses of a coin heads appeared 525 times. A two-sided test is performed in order tot est the claim that the coin is fair. The p-value of this test is approximately

a. about 1.1%

b. about 11%

c. about 20.6%

d. about 0.1%

The systolic blood pressure of a random sample of 30 employees at a company have been measured. A 95% confidence interval for the mean systolic blood pressure for the employees is computed to be $(122, 138)$. Which one of the following statements gives a valid interpretation of this interval?

a. 95% of the employees in the company have a systolic blood pressure between 122 and 138.

b. If the sampling procedure were repeated 100 times, then approximately 95 of the sample means would be between 122 and 138.

c. If the sampling procedure were repeated 100 times, then approximately 95 of the resulting 100 confidence intervals would contain the true mean systolic blood pressure for all employees of the company.

d. 95% of the sample of employees has a systolic blood pressure between 122 and 138.

Let $X \sim B(100, \frac{1}{3})$. An exact computation in \texttt{R} gives $P(X \leq 30) = 0.2765539$. Use the Central Limit Theorem and a continuity correction to approximate the probability $P(X \leq 30)$.

a. 0.274

b. 0.281

c. 0.267

d. 0.240

The length of time it takes workers to find a parking spot in the company parking lot follows a normal distribution with a mean of 4.5 minutes and a standard deviation of 1 minute. The cut-off time which 75.8% of the workers exceed when trying to find a parking spot in the company parking lot is

a. 5.2 min

b. 4.8 min

c. 3.8 min

d. 5.3 min

A random sample of 20 observations produced a sample mean $\bar{x} = 92.4$ and a sample standard deviation $s = 25.8$. Then, the standard error of the mean is approximately

a. 5.8

b. 1.3

c. 18.2

d. 4.6

A company makes a synthetic rubber bungee jumping cord with a braided covering of natural rubber and a minimum breaking strength of 450 kg. If the mean breaking strength of a sample falls below a specified level, the production process is stopped and the machines are checked. Which of the following would result in a Type I error?

a. None of the options given.

b. Stopping the production process when too many bungee jumping cords break.

c. Stopping the production process when the breaking strength is below the specified level.

d. Stopping the production process when the breaking strength is within specifications.