



# Statistics Advance quiz

9 out of 9 correct

1. What is a confidence interval?

- ☒ The range of values that is likely to contain the population parameter with a certain degree of confidence
- ☐ The probability of obtaining a sample statistic
- ☐ The margin of error in the estimation of the population parameter
- ☐ The degree of uncertainty in the population parameter estimation

**Explanation:** A confidence interval is a range of values that is likely to contain the true population parameter with a certain degree of confidence, usually expressed as a percentage.

2. Which distribution is used for the chi-square test?

- ☐ Normal distribution
- ☐ Student's t-distribution
- ☐ F-distribution
- ☒ Chi-square distribution

**Explanation:** The chi-square test is a statistical test that is used to compare observed frequencies with expected frequencies in a contingency table. The test statistic follows a chi-square distribution, which is a distribution that arises when the sum of squares of standard normal variables is taken.

3. What is the chi-square test used for?

- ☐ Testing the significance of the difference between two population means



- ☐ Testing the significance of the difference between two population proportions
- ☒ Testing the goodness of fit of a sample distribution to a theoretical distribution
- ☐ Testing the independence of two categorical variables

**Explanation:** The chi-square test is used to test the goodness of fit of a sample distribution to a theoretical distribution. It is also used to test the independence of two categorical variables, and to test the homogeneity of two or more populations.

4. Which of the following is true about the chi-square distribution?

- ☐ It is a symmetric distribution
- ☐ It has a mean of zero
- ☐ It has only one parameter, the degrees of freedom
- ☒ It is a continuous distribution

**Explanation:** The chi-square distribution is a continuous distribution that is positively skewed. It has only one parameter, the degrees of freedom, which determines its shape. It does not have a mean of zero, but its mean is equal to its degrees of freedom.

5. When should you use the normal distribution?

- ☒ When the sample size is large and the population standard deviation is known
- ☐ When the sample size is small and the population standard deviation is known
- ☐ When the sample size is large and the population standard deviation is unknown
- ☐ When the sample size is small and the population standard deviation is unknown

**Explanation:** The normal distribution is used when the sample size is large and the population standard deviation is known. In this case, the central limit theorem applies, and the sampling distribution of the sample mean is approximately normal. When the sample size is small or the population standard deviation is unknown, the t-distribution should be used instead.

6. A confidence interval for a population mean with a sample size of 50 and a confidence level of 95% is calculated to be (24.6, 28.2). What is the margin of error for this interval?

- ☐ 1.8
- ☒ 2.3
- ☐ 2.8
- ☐ 3.4

**Explanation:** The margin of error is half of the width of the confidence interval. Therefore, the margin of error is  $(28.2 - 24.6) / 2 = 1.8$ , which is closest to option b) 2.3.

7. A chi-square test is conducted to test the goodness of fit of a sample distribution to a theoretical distribution. The calculated chi-square statistic is 25.84, with 4 degrees of freedom. At a significance level of 0.05, what is the conclusion?

- ☒ Reject the null hypothesis
- ☐ Fail to reject the null hypothesis
- ☐ Accept the alternative hypothesis
- ☐ There is not enough information to make a conclusion

**Explanation:** To test the goodness of fit using the chi-square test, we compare the calculated chi-square statistic with the critical value from the chi-square distribution with  $(k-1)$  degrees of freedom, where  $k$  is the number of categories. In this case, the critical value at a significance level of 0.05 and 4 degrees of freedom is 9.488. Since the calculated chi-square statistic (25.84) is greater than the critical value (9.488), we reject the null hypothesis and conclude that the sample distribution does not fit the theoretical distribution.

8. A researcher wants to test whether there is a difference in the proportion of males and females who prefer chocolate ice cream. Which statistical test should be used?

- ☐ Two-sample t-test
- ☐ Chi-square test for goodness of fit
- ☒ Chi-square test for independence
- ☐ One-sample t-test

**Explanation:** The chi-square test for independence is used to test the association between two categorical variables. In this case, the variables are gender (male/female) and ice cream preference (chocolate/not chocolate). Therefore, the chi-square test for independence should be used to test whether there is a difference in the proportion of males and females who prefer chocolate ice cream.

9. What is the purpose of a confidence level in statistics?

- ☐ To determine the variability of a dataset
- ☐ To measure the strength of association between two variables
- ☐ To calculate the likelihood of obtaining a sample statistic
- ☒ To estimate the range within which a population parameter is likely to fall

**Explanation:** A confidence level is a measure of the certainty that a calculated interval contains the true population parameter. It represents the probability that the population parameter lies within a specified interval.

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