### Quiz: Advanced Statistics

1. What is a confidence interval?

- A) The range of values that is likely to contain the population parameter with a certain degree of confidence

- B) The probability of obtaining a sample statistic

- C) The margin of error in the estimation of the population parameter

- D) The degree of uncertainty in the population parameter estimation

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

- A) Normal distribution

- B) Student's t-distribution

- C) F-distribution

- D) Chi-square distribution

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

- A) Testing the significance of the difference between two population means

- B) Testing the significance of the difference between two population proportions

- C) Testing the goodness of fit of a sample distribution to a theoretical distribution

- D) Testing the independence of two categorical variables

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

- A) It is a symmetric distribution

- B) It has a mean of zero

- C) It has only one parameter, the degrees of freedom

- D) It is a continuous distribution

5. When should you use the normal distribution?

- A) When the sample size is large and the population standard deviation is known

- B) When the sample size is small and the population standard deviation is known

- C) When the sample size is large and the population standard deviation is unknown

- D) When the sample size is small and the population standard deviation is unknown

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?

- A) 1.8

- B) 2.3

- C) 2.8

- D) 3.4

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?

- A) Reject the null hypothesis

- B) Fail to reject the null hypothesis

- C) Accept the alternative hypothesis

- D) There is not enough information to make a conclusion

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?

- A) Two-sample t-test

- B) Chi-square test for goodness of fit

- C) Chi-square test for independence

- D) One-sample t-test

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

- A) To determine the variability of a dataset

- B) To measure the strength of association between two variables

- C) To calculate the likelihood of obtaining a sample statistic

- D) To estimate the range within which a population parameter is likely to fall

### Answers

1. \*\*A) The range of values that is likely to contain the population parameter with a certain degree of confidence\*\*

- A confidence interval provides an estimated range of values which is likely to include the population parameter.

2. \*\*D) Chi-square distribution\*\*

- The chi-square test uses the chi-square distribution to determine the goodness of fit or test for independence.

3. \*\*C) Testing the goodness of fit of a sample distribution to a theoretical distribution\*\*

- The chi-square test is used to determine if a sample distribution fits a theoretical distribution, and also for testing the independence of categorical variables.

4. \*\*C) It has only one parameter, the degrees of freedom\*\*

- The chi-square distribution is defined by its degrees of freedom.

5. \*\*A) When the sample size is large and the population standard deviation is known\*\*

- The normal distribution is used when the sample size is large (usually n > 30) and the population standard deviation is known.

6. \*\*B) 2.3\*\*

- The margin of error is half the width of the confidence interval. The width is 28.2 - 24.6 = 3.6, so the margin of error is 3.6 / 2 = 1.8.

7. \*\*A) Reject the null hypothesis\*\*

- With 4 degrees of freedom and a significance level of 0.05, the critical value is approximately 9.49. Since 25.84 > 9.49, we reject the null hypothesis.

8. \*\*C) Chi-square test for independence\*\*

- To test the difference in proportions of categorical variables (males and females preferring chocolate ice cream), the chi-square test for independence is appropriate.

9. \*\*D) To estimate the range within which a population parameter is likely to fall\*\*

- A confidence level indicates how confident we are that the true population parameter lies within the confidence interval.