Mathsbase Exam Questions Circle theorem

1) What is the symbol used to represent the standard deviation in statistics? (1 mark)

Answer: _____

2) A sample of data has a mean of 50 and a standard deviation of 5. Find the z-score for a data point with a value of 60. (2 marks)

Answer: _____

3) In a normal distribution, approximately what percentage of data falls within 1 standard deviation from the mean? (1 mark)

Answer: _____

4) The heights of a group of students are normally distributed with a mean of 160 cm and a standard deviation of 10 cm. What percentage of students have heights between 140 cm and 180 cm? (3 marks)

Answer: _____

5) What is the central limit theorem? (2 marks)

Answer: _____

6) A random sample of 100 fish has a mean weight of 2 kg and a standard deviation of 0.5 kg. Find the standard error of the mean. (2 marks)

Answer: _____

7) What is the formula for calculating the standard deviation of a sample? (2 marks)

Answer: _____

8) The average monthly salary of a group of employees is £2,000 with a standard deviation of £500. Assuming a normal distribution, find the probability that an employee earns less than £1,500. (3 marks)

Answer: _____

9) In a study, a sample of 500 students had a mean score of 70 with a standard deviation of 10. Construct a 95% confidence interval for the true population mean. (4 marks)

Answer: _____

10) Given a mean of 12 and a standard deviation of 3, find the z-score for a value of 15. (2 marks)

Answer: _____

11) In a hypothesis test, the null hypothesis states that there is no difference between two groups. True or false? (1 mark)

Answer: _____

12) What is a type I error in hypothesis testing? (1 mark)

Answer: _____

13) In a study, the observed p-value is 0.03. Interpret this result. (2 marks)

Answer: _____

14) For a significance level of 0.01, what is the corresponding critical value in a two-tailed hypothesis test? (2 marks)

Answer: _____

15) In a statistical study, what is the purpose of random sampling? (2 marks)

Answer: _____

16) In a chi-squared test, what is the null hypothesis typically stating? (1 mark)

Answer: _____

17) What is the formula for calculating the degrees of freedom in a chi-squared test? (2 marks)

Answer: _____

18) In a study, the chi-squared test statistic is 10.23 with 3 degrees of freedom. Determine the p-value for this test. (3 marks)

Answer: _____

19) In a study comparing two groups, the obtained t-value is 2.34. If the critical t-value at a significance level of 0.05 is 1.96, what would be the appropriate conclusion? (3 marks)

Answer: _____

20) Define the term "correlation coefficient." (2 marks)

Answer: _____

21) The correlation coefficient between two variables is -0.7. What does this value indicate about the relationship between the variables? (2 marks)

Answer: _____

22) What is the formula for calculating the coefficient of determination? (2 marks)

Answer: _____

23) In a regression analysis, if the coefficient of determination is 0.85, what percentage of the variation in the dependent variable can be explained by the independent variable? (2 marks)

Answer: _____

24) Compare and contrast positive skewness and negative skewness in a data distribution. (3 marks)

Answer: _____

25) In a study, the coefficient of determination is 0.65. Interpret this value in the context of regression analysis. (3 marks)

Answer: _____

26) What is the formula for calculating the margin of error in a confidence interval? (2 marks)

Answer: _____

27) In a study, a sample of 200 individuals is randomly selected. The sample proportion is 0.6. Calculate the standard error of the proportion. (3 marks)

Answer: _____

28) In a hypothesis test, what is a type II error? (1 mark)

Answer: _____

29) What is the purpose of statistical inference in a study? (2 marks)

Answer: _____

30) Explain the concept of statistical power and its importance in hypothesis testing. (3 marks) MARK SCHEME AND ANSWERS: 1) σ (1 mark) 2) z = (60 - 50) / 5 = 2 (2 marks) 3) Approximately 68% (1 mark) 4) 95% (3 marks) 5) The central limit theorem states that regardless of the shape of the population distribution, the sampling distribution of the mean approaches a normal distribution as the sample size increases. (2 marks) 6) 0.05 kg (2 marks) 7) s = sqrt[Σ(x - $\bar{x}$)^2 / (n-1)] (2 marks) 8) 0.0228 (3 marks) 9) 95% confidence interval: (67.63, 72.37) (4 marks) 10) z = (15 - 12) / 3 = 1 (2 marks) 11) True (1 mark) 12) Type I error occurs when the null hypothesis is rejected, but it is actually true. (1 mark) 13) The p-value of 0.03 indicates that there is strong evidence against the null hypothesis. (2 marks) 14) ±2.58 (2 marks) 15) Random sampling ensures that each member of the population has an equal chance of being included in the sample, thus increasing the generalizability of the results to the entire population. (2 marks) 16) The null hypothesis typically states that there is no association or relationship between two variables in a chi-squared test. (1 mark) 17) df = (number of rows - 1) * (number of columns - 1) (2 marks) 18) P-value = 0.0361 (3 marks) 19) We would reject the null hypothesis and conclude that there is a significant difference between the two groups. (3 marks) 20) The correlation coefficient represents the strength and direction of the linear relationship between two variables. (2 marks) 21) The negative correlation coefficient value (-0.7) indicates a strong negative linear relationship between the variables. As one variable increases, the other decreases. (2 marks) 22) r^2 = (covariance of x and y) / (standard

deviation of x)(standard deviation of y) (2 marks) 23) 85% (2 marks) 24) Positive skewness refers to a distribution with a tail on the right side, indicating a majority of lower values. Negative skewness refers to a distribution with a tail on the left side, indicating a majority of higher values. (3 marks) 25) The coefficient of determination (0.65) suggests that 65% of the variation in the dependent variable can be explained by the independent variable. (3 marks) 26) Margin of error = critical value * standard error (2 marks) 27) Standard error of proportion = sqrt[(0.6 * 0.4) / 200] ≈ 0.0346 (3 marks) 28) Type II error occurs when the null hypothesis is not rejected, but it is actually false. (1 mark) 29) Statistical inference allows us to draw conclusions and make predictions about a population based on sample data. (2 marks) 30) Statistical power is the probability of correctly rejecting the null hypothesis when it is false. It is important in hypothesis testing to ensure that significant differences or associations are identified. (3 marks)

Answer: _____