

Advanced Statistics and Probability

Mathematics · Answer Key · 25 Questions

1. In a normal distribution, what percentage of the data falls within three standard deviations of the mean?

- A) 68.2%
- B) 95.4%
- C) 99.7%**
- D) 99.9%

2. Which measure of central tendency is most sensitive to extreme outliers in a dataset?

- A) Median
- B) Mode
- C) Arithmetic Mean**
- D) Geometric Mean

3. What is the probability of drawing two consecutive aces from a standard 52-card deck without replacement?

- A) $1/13$
- B) $1/221$**
- C) $4/663$
- D) $1/169$

4. Which statistical term describes the 'spread' of a dataset, calculated as the square root of the variance?

- A) Interquartile Range
- B) Standard Deviation**
- C) Coefficient of Variation
- D) Mean Absolute Deviation

5. In probability theory, what does the 'Law of Large Numbers' state happens as the number of trials increases?

- A) The experimental probability approaches the theoretical probability**
- B) The variance becomes zero
- C) The distribution becomes skewed
- D) The sample size becomes irrelevant

6. What is the sum of the probabilities of all mutually exclusive and exhaustive outcomes in a sample space?

- A) 0
- B) 0.5
- C) 1**
- D) 100

7. Which value represents the median of a dataset?

- A) The average of all values
- B) The 50th percentile**
- C) The most frequent value
- D) The difference between maximum and minimum

8. In a binomial distribution, what does 'n' represent?

- A) Number of successes
- B) Probability of failure
- C) Number of independent trials**
- D) The expected value

9. What is the degree of freedom for a sample variance calculated from a dataset of size n?

- A) n
- B) n+1
- C) n-1**
- D) n/2

10. Which statistical test is used to determine if there is a significant difference between the means of two groups?

- A) Chi-squared test
- B) T-test**
- C) ANOVA
- D) Regression analysis

11. What is the range of a probability value?

- A) -1 to 1
- B) 0 to 1**
- C) 0 to 100
- D) Negative infinity to infinity

12. Which term describes the tail of a distribution being longer or fatter on one side?

- A) Kurtosis
- B) Skewness**
- C) Standardization
- D) Correlation

13. If two events A and B are independent, what is the formula for the probability of both occurring?

- A) $P(A) + P(B)$
- B) $P(A) * P(B)$**
- C) $P(A) / P(B)$
- D) $P(A) - P(B)$

14. What does the 'p-value' represent in hypothesis testing?

- A) The probability of the null hypothesis being true
- B) The significance level
- C) The probability of observing results as extreme as the data given the null hypothesis**
- D) The correlation coefficient

15. Which graph displays the frequency distribution of a continuous variable using bins?

- A) Pie chart
- B) Histogram**
- C) Scatter plot
- D) Line graph

16. What is the relationship between correlation and causation?

- A) Correlation implies causation
- B) Causation implies correlation
- C) Correlation does not imply causation**
- D) They are the same concept

17. In a standard normal distribution (Z-distribution), what is the mean?

- A) 0**
- B) 1
- C) 0.5
- D) 10

18. Which statistical measure identifies the middle 50% of the data?

- A) Range
- B) Standard Deviation
- C) Interquartile Range**
- D) Variance

19. What is the probability of rolling a sum of 7 with two fair six-sided dice?

- A) $\frac{1}{6}$**
- B) $\frac{1}{12}$
- C) $\frac{1}{36}$
- D) $\frac{1}{7}$

20. What is the complement of event A if the probability of A is 0.35?

- A) 0.35
- B) 0.65**
- C) 0.70
- D) 0

21. Which coefficient measures the strength and direction of a linear relationship between two variables?

- A) R-squared
- B) Pearson correlation coefficient**
- C) Z-score
- D) T-statistic

22. How many outcomes are possible when flipping a fair coin 4 times?

- A) 4
- B) 8
- C) 12
- D) 16**

23. What is the variance of a constant value?

- A) 0**
- B) 1
- C) The constant itself
- D) Infinite

24. What does the 'Central Limit Theorem' imply about the distribution of sample means?

- A) It is always uniform
- B) It is always binomial
- C) It approaches a normal distribution as sample size increases**
- D) It is always the same as the population distribution

25. Which distribution describes the probability of a given number of events occurring in a fixed interval of time?

- A) Normal
- B) Poisson**
- C) Binomial
- D) Geometric