

Advanced Statistical Foundations

Statistics & Probability · Answer Key · 12 Questions

1. Who is credited with the first formal definition of the Law of Large Numbers, published in 'Ars Conjectandi'?

- A) Jacob Bernoulli**
- B) Pierre-Simon Laplace
- C) Abraham de Moivre
- D) Thomas Bayes

2. Which statistical distribution is defined by the probability density function $f(x) = (1/\lambda)e^{-x/\lambda}$ for $x \geq 0$?

- A) Normal distribution
- B) Exponential distribution**
- C) Poisson distribution
- D) Chi-squared distribution

3. What is the formal name for the phenomenon where a sequence of independent trials with equal probability eventually results in the empirical mean converging to the expected value?

- A) Central Limit Theorem
- B) Strong Law of Large Numbers**
- C) Law of Iterated Logarithms
- D) Slutsky's Theorem

4. In the context of the Birthday Problem, what is the minimum number of people required in a room for the probability of at least two people sharing a birthday to exceed 50%?

- A) 365
- B) 183
- C) 23**
- D) 50

5. Which mathematician introduced the term 'percentile' in his 1885 publication 'Anthropometric Laboratory'?

- A) Karl Pearson
- B) Francis Galton**
- C) Ronald Fisher
- D) William Sealy Gosset

6. What is the specific value of the kurtosis for any standard normal distribution?

- A) 0
- B) 1
- C) 2
- D) 3**

7. The Kolmogorov-Smirnov test is primarily used for which type of statistical analysis?

- A) Comparing two categorical variables
- B) Assessing the goodness of fit of a cumulative distribution**
- C) Calculating the variance of a regression model
- D) Estimating the bias of a sample mean

8. Which distribution is the sum of the squares of k independent standard normal random variables?

- A) Student's t-distribution
- B) F-distribution
- C) Chi-squared distribution**
- D) Gamma distribution

9. In Bayesian statistics, what is the name of the probability distribution that represents one's uncertainty about a parameter before the current data is observed?

- A) Posterior distribution
- B) Likelihood function
- C) Prior distribution**
- D) Marginal distribution

10. Which English statistician developed the concept of 'Student's t-distribution' while working for the Guinness Brewery?

- A) William Sealy Gosset**
- B) Karl Pearson
- C) Ronald Fisher
- D) Egon Pearson

11. What does the 'p' stand for in the context of a p-value in frequentist hypothesis testing?

- A) Probability**
- B) Power
- C) Precision
- D) Parameter

12. The 'Gambler's Ruin' is a classic problem in probability that serves as a specific application of which mathematical concept?

- A) Random walk
- B) Markov chain
- C) Stochastic process
- D) All of the above**