Q1. What is a probability distribution, exactly? If the values are meant to be random, how can you predict them at all?

A probability distribution is a mathematical function or model that describes the likelihood or probability of occurrence of different possible outcomes or values in a given set or range. It provides information about the probabilities associated with each possible value or outcome.

In the context of statistics and probability theory, probability distributions are used to represent uncertainty and randomness in various phenomena. They help us understand the likelihood of different outcomes or events occurring and provide a framework for making predictions and statistical inferences

Q2. Is there a distinction between true random numbers and pseudo-random numbers, if there is one? Why are the latter considered “good enough”?

Yes, there is a distinction between true random numbers and pseudo-random numbers.

True random numbers are generated from a source that is inherently unpredictable and unpredictable, such as atmospheric noise, radioactive decay, or chaotic physical processes. They exhibit genuine randomness and are unpredictable by nature. True random numbers have properties like entropy and lack of patterns, making them suitable for applications requiring high levels of randomness and security.

true random numbers are generated from inherently unpredictable sources, while pseudo-random numbers are generated using deterministic algorithms that mimic the statistical properties of randomness. Pseudo-random numbers are considered "good enough" for many applications because they exhibit statistical randomness, are computationally efficient, and can generate large sequences of numbers quickly. However, for applications requiring high security or cryptographic purposes, true random numbers from physical processes are often preferred

Q3. What are the two main factors that influence the behaviour of a "normal" probability distribution?

The behavior of a "normal" probability distribution, also known as a Gaussian distribution or bell curve, is primarily influenced by two main factors: the mean and the standard deviation

Q4. Provide a real-life example of a normal distribution.

One real-life example of a normal distribution is the distribution of heights of adult humans. In many populations, the heights of adults tend to follow a normal distribution pattern.

The normal distribution of heights allows us to make statistical observations, such as determining the percentage of individuals within a specific height range or identifying outliers. It provides a useful framework for understanding the characteristics and variability of a particular attribute within a population

Q5. In the short term, how can you expect a probability distribution to behave? What do you think will happen as the number of trials grows?

In the short term, the behavior of a probability distribution can be subject to randomness and fluctuations. Each trial or observation may deviate from the expected probabilities or outcomes due to the inherent variability of the process.

Q6. What kind of object can be shuffled by using random.shuffle?

The random.shuffle function in Python can be used to shuffle the elements of a mutable sequence. Mutable sequences are objects that can be modified

Q7. Describe the math package's general categories of functions.

The math package in Python provides a wide range of mathematical functions and constants for performing various mathematical operations. The functions in the math package can be broadly categorized into the following general categories:

Basic Mathematical Functions

Numeric and Rounding Functions

Mathematical Constants

Statistical Functions

Q8. What is the relationship between exponentiation and logarithms?

Exponentiation is the process of raising a base number to a given exponent. For example, in the expression "a^b" (a raised to the power of b), a is the base and b is the exponent. The result of exponentiation is the value obtained by multiplying the base (a) by itself b times.

Logarithms, on the other hand, are the inverse operation of exponentiation. A logarithm is used to determine the exponent to which a specific base must be raised to obtain a given number. In the expression "log(base, number)", the base is the logarithmic base, and the number is the value for which the logarithm is calculated. The result of a logarithm is the exponent required to raise the base to obtain the given number

Q9. What are the three logarithmic functions that Python supports?

Natural logarithm (ln)

Base 10 logarithm

Custom base logarithm