Q1. What is a probability distribution, and how can values be predicted if they are meant to be random?

- Answer: A probability distribution describes how likely each possible value of a random variable is. While individual outcomes are unpredictable, probability distributions provide a framework for understanding the likelihood of different outcomes based on underlying patterns or models.

Q2. Is there a distinction between true random numbers and pseudo-random numbers, and why are pseudo-random numbers considered "good enough"?

- Answer: Yes, true random numbers are generated from unpredictable physical processes, while pseudo-random numbers are generated by algorithms and appear random. Pseudo-random numbers are considered "good enough" for many applications because they exhibit statistical randomness and are computationally efficient.

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

- Answer: The two main factors are the mean (average) and the standard deviation. The mean determines the center of the distribution, while the standard deviation controls its spread or variability.

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

- Answer: Heights of adult humans often follow a normal distribution. Most people cluster around the average height, with fewer individuals significantly taller or shorter.

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

- Answer: In the short term, individual outcomes may vary widely. However, as the number of trials (samples) increases, the distribution tends to converge to the expected behavior described by the probability distribution due to the law of large numbers.

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

- Answer: The `random.shuffle` function can shuffle a mutable sequence object, such as a list, in-place.

Q7. Describe the general categories of functions in the math package.

- Answer: The math package in Python contains functions for mathematical operations. Categories include basic arithmetic (e.g., `sqrt`, `log`), trigonometric (e.g., `sin`, `cos`), exponential (e.g., `exp`, `pow`), and more advanced mathematical functions.

Q8. What is the relationship between exponentiation and logarithms?

- Answer: Logarithms are the inverse operation of exponentiation. If `a^b = c`, then the logarithm base `a` of `c` is `b`. In symbols, `log\_a(c) = b`.

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

- Answer: Python supports three logarithmic functions: `log(x)` (natural logarithm, base `e`), `log10(x)` (base 10 logarithm), and `log2(x)` (base 2 logarithm).