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

***Ans***:

A probability distribution is a mathematical function that describes the likelihood of different outcomes in a random event or process. In other words, it is a way of representing the possible values of a random variable.

By using probability distributions, it is possible to make predictions and draw conclusions about random variables, even if the values of those variables cannot be predicted with certainty.

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

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

while pseudo-random numbers are not truly random, they are considered "good enough" for many practical purposes, including simulations, cryptography, and statistical analysis. This is because they exhibit many of the properties of true randomness, such as unpredictability, uniformity, and independence, and they can be generated quickly and efficiently.

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

***Ans***: The two main factors that influence the behaviour of a normal probability distribution are its mean and standard deviation.

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

***Ans***: 1. the distribution of heights of adult males in a population.

2. distribution of weights of objects produced by a manufacturing process,

3. the distribution of test scores in a large class.

4. the distribution of IQ scores in 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?

***Ans***:

the behaviour of a probability distribution can be quite unpredictable, and individual outcomes can be highly variable. However, as the number of trials grows, the distribution will tend to converge toward its expected shape, and the behaviour of the distribution will become more predictable and consistent.

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

***Ans***:

The random.shuffle() function in Python can be used to shuffle any mutable sequence object, such as a list or an array. This function shuffles the elements of the sequence in place, meaning that the original sequence is modified and returned.

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

***Ans***: Here are some of the main categories of functions provided by the math package:

1. Basic arithmetic functions: These functions perform basic arithmetic operations on numbers, such as addition (math.add()), subtraction (math.subtract()), multiplication (math.multiply()), and division (math.divide()).

2. Trigonometric functions: These functions perform various trigonometric operations, such as calculating the sine (math.sin()), cosine (math.cos()), and tangent (math.tan()) of an angle, as well as their inverse functions (math.asin(), math.acos(), and math.atan()).

3. Exponential and logarithmic functions: These functions deal with exponential and logarithmic operations, such as calculating the value of e raised to a power (math.exp()), calculating the natural logarithm (math.log()), and calculating the base-10 logarithm (math.log10()).

4. Hyperbolic functions: These functions deal with hyperbolic trigonometric operations, such as calculating the hyperbolic sine (math.sinh()), hyperbolic cosine (math.cosh()), and hyperbolic tangent (math.tanh()).

5. Special functions: These functions perform various special mathematical operations, such as calculating the factorial of a number (math.factorial()), calculating the gamma function (math.gamma()), and calculating the error function (math.erf()).

6. Constants: The math package also provides several useful mathematical constants, such as pi (math.pi), Euler's number (math.e), and the golden ratio (math.phi).

Q8. What is the relationship between exponentiation and logarithms?

***Ans***: Exponentiation and logarithms are inverse operations of each other.

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

***Ans***:

Python's math module supports three logarithmic functions:

1. math.log(x) returns the natural logarithm (base e) of x.

2. math.log10(x) returns the logarithm of x to the base 10.

3. math.log2(x) returns the logarithm of x to the base 2.