Q1 The PMF is a function that describes the probability of a discrete random variable taking on a certain value. It is a mathematical function that describes the probability that a random variable will take on a specific value rather than falling within a range of values.

The PDF is a function that describes the probability of a continuous random variable taking on a certain value. It is a mathematical function that describes the probability that a random variable will fall within a certain range of values.

Q2 The CDF is a function that describes the probability that a random variable (continuous or discrete) will take on a value less than or equal to a certain value. It is a mathematical function that describes the probability that a random variable will fall within a certain range of values, up to and including a specific value.

CDf uses:- The limit of the CDF as the random variable approaches positive infinity is 1.The CDF can be visualized as a curve that starts at 0 and increases monotonically to 1. $FX(x)=P(X\leq x)$, for all $x\in R$.

Let X be a random variable (either continuous or discrete), then the CDF of X has the following properties: (i) The CDF is a non-decreasing. (ii) The maximum of the CDF is when $x = \infty$: $FX (+\infty)=1$. (iii) The minimum of the CDF is when $x = -\infty$: $FX (-\infty)=0$.

Q3 In a normal distribution, data are symmetrically distributed with no skew. Most values cluster around a central region, with values tapering off as they go further away from the center. The measures of central tendency (mean, mode, and median) are exactly the same in a normal distribution.

The random variables following the normal distribution are those whose values can find any unknown value in a given range. For example, finding the height of the students in the school. Here, the distribution can consider any value, but it will be bounded in the range say, 0 to 6ft.

Q4

1.The mean, median, and mode of the distribution coincide. 2.The curve of the distribution is bell-shaped and symmetrical about the line $x=\mu$. 3.The total area under the curve is 1. 4.Exactly half of the values are to the left of the center, and the other half to the right.

for practical purpose normal distribution is good enough to represent the distribution of continuous variable like-height,weight,blood pressure etc.. often used to aproximate other distribution. normal distribution has significant use in statistical quality control.

Q5 Bernoulli Distribution:-has only two bernoulli trials or possible outcomes, namely 1 (success) and 0 (failure), and a single trial. So the random variable X with a Bernoulli distribution can take the value 1 with the probability of success, say p, and the value 0 with the probability of failure, say q or 1-p.

Ex:- All you cricket junkies out there! At the beginning of any cricket match, how do you decide who will bat or ball? A toss! It all depends on whether you win or lose the toss, right? Let's say if the toss results in a head, you win. Else, you lose.

Bernoulli deals with the outcome of the single trial of the event, whereas Binomial deals with the outcome of the multiple trials of the single event. Bernoulli is used when the outcome of an event is required for only one time, whereas the Binomial is used when the outcome of an event is required multiple times

Q6 a mean of 50 and a standard deviation of 10. Z=50-60/10=1 observation will be greater than 60. f (X) = 1 2 π σ e − (x − μ) 2 / 2 σ 2 , − ∞ < x < ∞ , − ∞ < μ < ∞ , σ > 0.

Q7

Uniform distribution:-When you roll a fair die, the outcomes are 1 to 6. The probabilities of getting these outcomes are equally likely, which is the basis of a uniform distribution. Unlike Bernoulli Distribution, all the n number of possible outcomes of a uniform distribution are equally likely.

The number of bouquets sold daily at a flower shop is uniformly distributed, with a maximum of 40 and a minimum of 10. Let's try calculating the probability that the daily sales will fall between 15 and 30. The probability that daily sales will fall between 15 and 30 is (30-15)*(1/(40-10)) = 0.5.Similarly, the probability that daily sales are greater than 20 is = 0.667

Q8 Z-scores are important because they offer a comparison between two scores that are not in the same normal distribution. They are also used to obtain the probability of a z-score to take place within a normal distribution. If a z-score gives a negative value, it means that raw data is lesser than mean.

Positive Z Score Table: It means that the observed value is above the mean of total values. Negative Z Score Table: It means that the observed value is below the mean of total values.

Q9

The central limit theorem (CLT) states that the distribution of sample means approximates a normal distribution as the sample size gets larger, regardless of the population's distribution. Sample sizes equal to or greater than 30 are often considered sufficient for the CLT to hold. The central limit theorem says that the sampling distribution of the mean will always be normally distributed, as long as the sample size is large enough. Regardless of whether the population has a normal, Poisson, binomial, or any other distribution, the sampling distribution of the mean will be normal. A normal distribution is a symmetrical, bell-shaped distribution, with increasingly fewer observations the further from the center of the distribution. In probability theory, the central limit theorem (CLT) states that, in many situations, when independent and identically distributed random variables are added, their properly normalized sum tends toward a normal distribution.

Q10 Assumptions Behind the Central Limit Theorem The data must adhere to the randomization rule. It needs to be sampled at random. The samples should be unrelated to one another. One sample should not impact the others. The central limit theorem states that when the sample size is large and has a finite variance, the samples will be normally distributed and the mean of samples (say $\bar{x}$) will be approximately equal to the mean of the whole population (μ).

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