**CBA: Practice Problem Set 2**

**Topics: Sampling Distributions and Central Limit Theorem**

1. Examine the following normal Quantile plots carefully. Which of these plots indicates that the data …
2. Are nearly normal?
3. Have a bimodal distribution? (One way to recognize a bimodal shape is a “gap” in the spacing of adjacent data values.)
4. Are skewed (i.e. not symmetric) ?
5. Have outliers on both sides of the center?



Answer : Option D

1. For each of the following statements, indicate whether it is True/False. If false, explain why.

The manager of a warehouse monitors the volume of shipments made by the delivery team. The automated tracking system tracks every package as it moves through the facility. A sample of 25 packages is selected and weighed every day. Based on current contracts with customers, the weights should have *μ* = 22 lbs. and *σ* = 5 lbs.

1. Before using a normal model for the sampling distribution of the average package weights, the manager must confirm that weights of individual packages are normally distributed.
2. The standard error of the daily average SE() = 1.

Answers:

1. True.

Explanation:

Before using a normal model for the sampling distribution of the average package weights, the manager must confirm that weights of individual packages are normally distributed. This is because the Central Limit Theorem states that the sampling distribution of the sample mean approaches a normal distribution as the sample size increases, only if the population from which the samples are drawn is normally distributed. So, if the weights of individual packages are not normally distributed, the assumption required for using a normal model for the sampling distribution of the average package weights would be violated.

1. True

Explanation:

The standard error of the daily average can be calculated using the formula:

SE(Standard Error) = where, is the population standard deviation and n is the sample size

= = 1

Therefore, SE(Standard Error) =1

1. Auditors at a small community bank randomly sample 100 withdrawal transactions made during the week at an ATM machine located near the bank’s main branch. Over the past 2 years, the average withdrawal amount has been $50 with a standard deviation of $40. Since audit investigations are typically expensive, the auditors decide to not initiate further investigations if the mean transaction amount of the sample is between $45 and $55. What is the probability that in any given week, there will be an investigation?
2. 1.25%
3. 2.5%
4. 10.55%
5. 21.1%
6. 50%

Answer: D. 21.1%

Explanation:

To find the probability of an investigation, we need to determine the probability that the mean transaction amount of the sample falls outside the range of $45 to $55.

Given:

Population mean (μ) = $50

Population standard deviation (σ) = $40

Sample size (n) = 100

Range for investigation = $45 to $55

First, let's calculate the standard error of the sample mean SE (X̅)

SE (X̅) = = = = 4

Next, we find the z-scores corresponding to the lower and upper bounds of the investigation range:

Using a standard normal distribution table or calculator, we find the probabilities associated with these z-scores:

The total probability of an investigation is the sum of these probabilities:

Converting this to a percentage, we get approximately 21.12%. Therefore, the closest option is:

D. 21.1%

1. The auditors from the above example would like to maintain the probability of investigation to 5%. Which of the following represents the minimum number transactions that they should sample if they do not want to change the thresholds of 45 and 55? Assume that the sample statistics remain unchanged.
2. 144
3. 150
4. 196
5. 250
6. Not enough information

Answer: D. 250

Explanation:

To maintain a probability of investigation of 5%, we need to adjust the sample size such that the probability of falling outside the range of $45 to $55 is 5%.

Given that the sample statistics remain unchanged:

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We know that the z-score associated with a 5% probability in a standard normal distribution (two-tailed) is approximately z ≈ ±1.96.

The standard errors of the sample mean (SE (X̅)) remains the same:

SE (X̅) = = = = 4

To find the required sample size, we can rearrange the formula for the z-score:

Since the sample size must be an integer, the minimum number of transactions the auditors should sample is 247. However, this is not an option provided. Among the given options, the closest one is D. 250. Therefore, the answer is:D

1. An educational startup that helps MBA aspirants write their essays is targeting individuals who have taken GMAT in 2012 and have expressed interest in applying to FT top 20 b-schools. There are 40000 such individuals with an average GMAT score of 720 and a standard deviation of 120. The scores are distributed between 650 and 790 with a very long and thin tail towards the higher end resulting in substantial skewness. Which of the following is likely to be true for randomly chosen samples of aspirants?
2. The standard deviation of the scores within any sample will be 120.
3. The standard deviation of the mean of across several samples will be 120.
4. The mean score in any sample will be 720.
5. The average of the mean across several samples will be 720.
6. The standard deviation of the mean across several samples will be 0.60

Answer:

D. The average of the mean across several samples will be 720.

Explanation:

The average of the means across several samples, also known as the sampling distribution of the sample mean, is expected to be equal to the population mean, which is 720 in this case.