

Solution

1[4pt]. If a sample from a normal population with mean μ and variance σ^2 , the average \bar{X} with sample size n follows Normal distribution. While for any other shape of population, the Central Limit Theorem holds for large enough sample size, $n \geq$ 30.

$$\text{Mean } E(\bar{X}) = \underline{\mu}, \text{ standard deviation } SD(\bar{X}) = \underline{\sigma/\sqrt{n}}$$

2. [3 pt] A researcher plans to collect data from a normal population with unknown mean and known standard deviation, and then to compute a confidence interval for the mean. Which of the following will produce the narrowest interval?

- A) $n=10$, 90 percent confidence level B) $n= 30$, 90 percent confidence level
C) $n=30$, 95 percent confidence level D) $n= 10$, 95 percent confidence level

$$\text{Confidence interval: } \bar{x} \pm z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$$

Answer: B

3. [3 pt] The Food and Drug Administration (FDA) needs to estimate the average content of an additive in a given food product. A random sample of 16 portions of the product has average 8.9 units. Suppose the standard deviation of population is known $\sigma=0.4$ units. The 95% confidence interval for the average number of units of additive in the population of portions of this food product is 8.9 ± 0.2 . Which statement of the following is a reasonable representation of the confidence interval?

- A) The content of the additive in about 95% of all portions is between 8.7 and 9.1 .
B) About 95% of sample averages of portions based on the samples with size 16 will be between 8.7 and 9.1.
C) Based on all the samples with size 16, about 95% of confidence intervals will cover the true average content μ .
D) The true average content μ will fall into the interval (8.7, 9.1) with probability 95%.

Answer: C