1. Suppose it is known that 43% of Americans own an iPhone. A random sample of 50 Americans is selected.

   (a) What is the probability that the sample proportion who own an iPhone is between 45% and 50%?

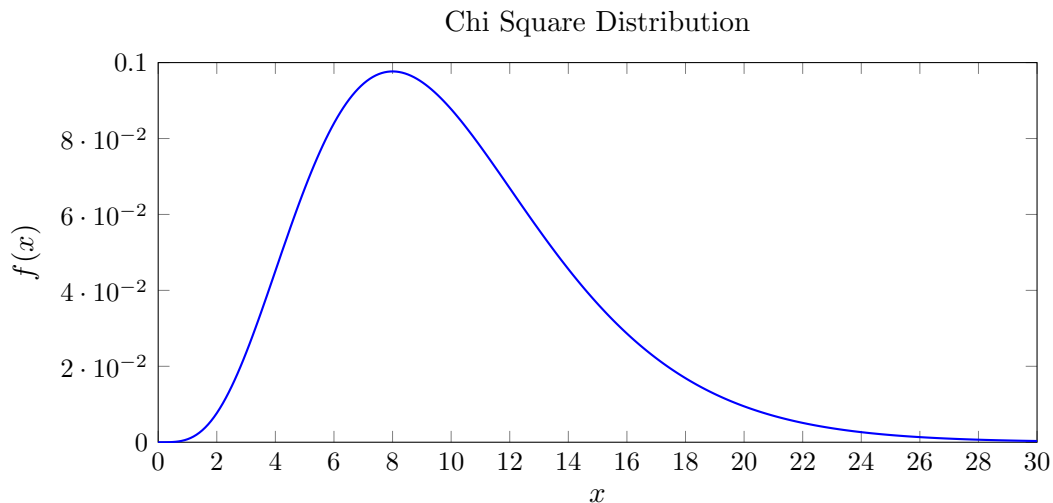   (b) If a random sample of 75 Americans is selected, what is the probability that more than 50% own an iPhone?

2. Which of the following statements is incorrect?

  A. The larger the sample size, the larger the spread of the sampling distribution.

  B. Provided the population is much larger than the sample, the spread does not depend on population size.

  C. Bias affects the center, not the spread, of a sampling distribution.

  D. A sample distribution and a sampling distribution describe different concepts.

  E. As sample size increases, the sample distribution more closely resembles the population distribution.

3. Which of the following statements is incorrect?

  A. For a random sample, the sampling distribution of $\bar{x}$ has mean $\mu$.

  B. When observations are independent, the standard deviation of $\bar{x}$ is $\sigma/\sqrt{n}$.

  C. If the population distribution is normal, then $\bar{x}$ is normally distributed for any sample size $n$.

  D. For sufficiently large $n$, the sampling distribution of $\bar{x}$ is approximately normal, even if the population distribution is not normal.

  E. The Central Limit Theorem applies even when observations are not independent.

4. Which of the following is a true statement?

  A. The mean of $\hat{p}$ differs from $p$ by about 1.96 standard deviations.

  B. The standard deviation of $\hat{p}$ is $\sqrt{np(1-p)}$.

  C. $\hat{p}$ is normal whenever $n \geq 30$.

  D. The sample proportion is a random variable with a probability distribution.

  E. All of the above are true.

5. Which of the following statements is incorrect?

  A. Sample statistics estimate population parameters.

  B. Smaller samples tend to have more variability.

  C. Parameters are fixed; statistics vary.

  D. The sample distribution becomes normal as $n$ increases.

  E. All of the above are true.

6. The price of a dozen donuts is normally distributed with mean $10.00 and standard deviation $0.50. A customer buys a dozen donuts on each of five days. What is the probability the total cost exceeds $52.00?

7. Suppose 15% of mines in a region strike gold. In a random sample of 200 mines, what is the probability that more than 18% strike gold?

8. In an SRS of 1000 people, 6.7% graduate with a STEM degree. What is the probability that more than 8% graduate with a STEM degree?

9. $X_1, \ldots, X_{500}$ are independent random variables with $X_i \sim \chi_{10}^2$, where $E(X) = 10$ and $\text{Var}(X) = 20$.

Chi Square Distribution



Describe the sampling distribution of $\bar{x}$.

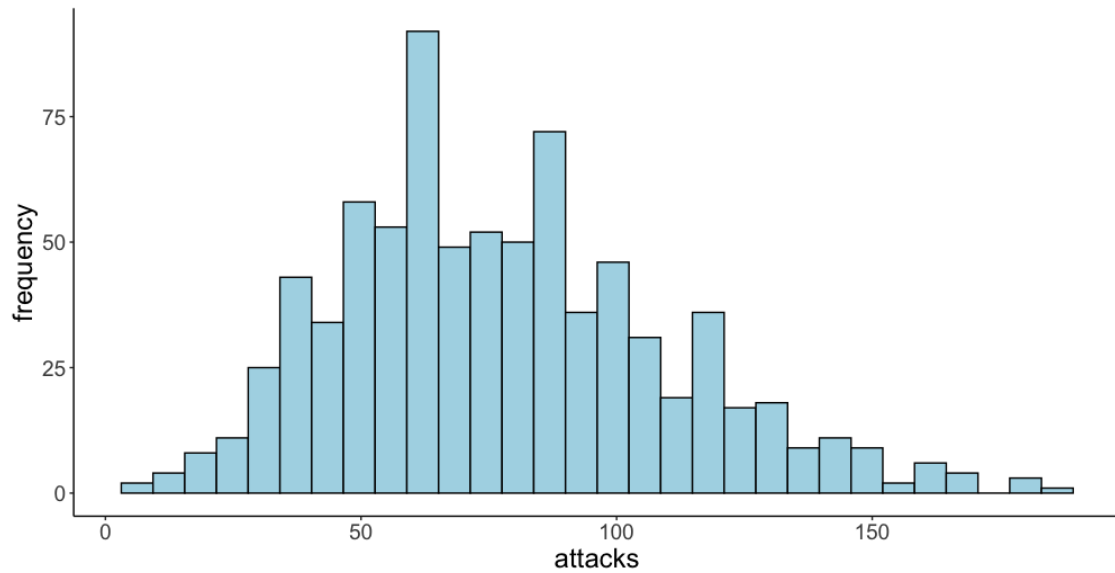10. In each of the following cases, state whether it is appropriate to use

$$\frac{\bar{x} - \mu}{s/\sqrt{n}} \sim t_{n-1}.$$

(a) $n = 100$, population is Normal$(10, 2)$.

(b) $n = 10$, population is Normal$(10, 2)$.

(c) $n = 10$, population is Exponential$(3)$.

11. A random sample of $n = 801$ Pokémon has $\bar{x} = 78$ and $s = 32$. The true mean attack score is $\mu = 70$.



What is the probability that a future sample has an average attack score less than 75?

12. A factory produces bolts with mean length 5.0 cm and standard deviation 0.4 cm. A random sample of 64 bolts is selected. What is the probability the sample mean is between 4.9 cm and 5.1 cm?

13. In a population, 62% of voters support a ballot initiative. A random sample of 400 voters is selected. What is the probability the sample proportion is within 3 percentage points of the true proportion?

14. The weights of cereal boxes have mean 18 oz and standard deviation 0.6 oz. What sample size is required so that the probability the sample mean is within 0.1 oz of the true mean is at least 0.95?