7.3 Sampling Distribution of a Sample Mean

Learning Objectives:
1. Find the mean and standard deviation of the sampling distribution of a sample mean $\bar{x}$. Check the 10% condition before calculating $\sigma_{\bar{x}}$.
2. Explain how the shape of the sampling distribution of $\bar{x}$ is affected by the shape of the population distribution and the sample size.
3. If appropriate, use a Normal distribution to calculate probabilities involving $\bar{x}$.

Vocabulary: sampling distribution of $\bar{x}$, mean of the sampling distribution, standard deviation of the sampling distribution of $\bar{x}$, Central Limit Theorem, Normal/Large Sample Condition for Sample Means

Goal: Trying to anticipate the center, spread, and shape of a sampling distribution of $\bar{x}$ without simulation.

ACTIVITY	Onlinestatbook Sampling Applet

Based on the computer activity, what do we know about the shape, center, and spread of the sampling distribution of a sample mean?

shape:

center:

spread:

Read 451–453
What are the mean and standard deviation of the sampling distribution of a sample mean? Are these formulas on the formula sheet? Are there any conditions for using these formulas?

> ***AP Exam Tip***: Notation matters. The symbols $\hat{p}, \bar{x}, p, \mu, \sigma, \mu_{\hat{p}}, \sigma_{\hat{p}}, \mu_{\bar{x}}, and \ \sigma_{\bar{x}}$ all have specific and different meanings. Either use the notation correctly or don't use them at all. You can expect to lose credit if you use incorrect notation.

Read 453–456
What is the shape of the sampling distribution of a sample mean when the sample is taken from a Normally distributed population? Does the sample size matter?

Alternate Example: At the P. Nutty Peanut Company, dry-roasted, shelled peanuts are placed in jars by a machine. The distribution of weights in the jars is approximately Normal, with a mean of 16.1 ounces and a standard deviation of 0.15 ounces.

    (a) Without doing any calculations, explain which outcome is more likely: randomly selecting a single jar and finding that the contents weigh less than 16 ounces or randomly selecting 10 jars and finding that the average contents weigh less than 16 ounces.

    (b) Find the probability of each event described above.

Read 456–460

What is the shape of the sampling distribution of a sample mean when the sample is NOT taken from a Normally distributed population? Does the sample size matter? Does this concept have a name?

Draw an SRS of size n from any population with mean μ and a finite standard deviation σ . The

_____ says that when n is large, the sampling distribution of

the sample mean $\bar{x}$ is approximately Normal.

Alternate Example: Suppose that the number of texts sent during a typical day by a randomly selected high school student follows a right-skewed distribution with a mean of 15 and a standard deviation of 35. Assuming that students at your school are typical texters, how likely is it that a random sample of 50 students will have sent more than a total of 1000 texts in the last 24 hours?