Sequence of activities to develop reasoning about samples and sampling distributions.

Milestones: Ideas and Concepts	*Suggested Activities*
INFORMAL IDEAS PRIOR TO FORMAL STUDY OF SAMPLES AND SAMPLING DISTRIBUTIONS	
• Population parameter is fixed but sample statistics vary from sample to sample.	• The Gettysburg Address Activity (Lesson 3, Data Unit)
• The idea of a random sample.	• The Gettysburg Address Activity (Lesson 3, Data Unit)
• As a sample grows, or as more data are collected, at some point the sample provides a stable estimate of the population parameter.	• Growing a Distribution Activity (Lesson 1, Distribution Unit).
• Larger random samples are more likely to be representative of the population than small ones.	❖ An Activity where samples are taken from a specified population and the size of the sample is increased to determine at what point the estimates of the population are stable. (The symbol ❖ indicates that this activity is not included in these lessons.)
• The size of a representative sample is not related to a particular percentage of the population. A large well-chosen sample can be a good one even if it is a small percent of the population.	❖ An activity where different sample sizes are examined in light of how well they represent the population in terms of shape, center and spread.
FORMAL IDEAS OF SAMPLES AND SAMPLING DISTRIBUTIONS	
• Sample variability: Samples vary for a given sample size, for random sample from the same population.	• Reese's Pieces Activity (Lesson 1: "Sampling from a Population")
• Variability of sample statistics from sample to sample.	• Reese's Pieces Activity (Lesson 1)
• There are three levels of data involved in taking random samples: the population, the individual samples, and the distribution of sample statistics.	• Reese's Pieces Activity (Lesson 1)
• How and why statistics from small samples vary more than statistics from large samples.	• Reese's Pieces Activity (Lesson 1)
• Sample statistics can be graphed and summarized in a distribution, just as raw data may be graphed and summarized.	• Reese's Pieces Activity (Lesson 1)
• Understanding that a simulation of a large number (e.g., 500) sample	❖ An activity using a simulation computer tool that draws students'

statistics is a good approximation of a sampling distribution.	attention to these ideas.
• Understanding that for a large number of trials (simulations) what is important to focus on is the change in sample size, not the change in number of simulations.	❖ An activity using a simulation computer tool that draws students' attention to these ideas.
• Although sample statistics vary from population parameter, they vary in a predictable way.	• Body Temperatures, Sampling Words and Sampling Pennies Activities (Lesson 2: "Generating Sampling Distributions").
• When and why a distribution of sample statistics (for large enough samples) looks bell shaped.	• Central Limit Theorem Activity (Lesson 3: "Describing the Predictable Pattern: The Central Limit Theorem").
• Distributions of sample statistics tend to have the same predicable pattern for large random samples.	• Central Limit Theorem Activity (Lesson 3).
• Understanding how the Central Limit Theorem describes the shape, center and spread of sampling distributions of sample statistics.	• Central Limit Theorem Activity (Lesson 3).
BUILDING ON FORMAL IDEAS OF SAMPLES AND SAMPLING DISTRIBUTIONS IN SUBSEQUENT TOPICS	
• Understand the role of sample variability in making statistical inferences.	• Activities in Lessons 1, 2, 3 and 4, Statistical Inference Unit