Computer Activities to Support Learning Traditional Math Stat Topics
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Joint Statistical Meetings, August 7, 2006

Why:
1. Enhances visualization and understanding of sampling distributions.
2. Encourages students to think about what statistic would be useful as an estimator rather than just picking from the usual set of statistics.
3. Enables better discussion of the structure of proofs – why the assumptions are needed.
4. In a good program, students will learn to do simulations and computer-intensive methods. When those are introduced only in applied courses, not all students understand easily how they and theoretical statistics fit into an overall picture of the field of statistics and statistical methods.

What:
1. German Tank problem. (Usually I call it the “enemy” tank problem.)
2. Construct complete sampling distributions by hand. (Small ones) Investigate them.
3. Simulate sampling distributions using computer software.
4. How large must “n” be to use the result of the Central Limit Theorem?
5. Can you use the t-distribution even if the population distribution is skewed? When?

Learning opportunities:
1. How does our choice of sampling method affect the sampling distribution? (Problem 2. Sampling with replacement and sampling without replacement.)
2. What does it mean to use a computer to find the sampling distribution? (Problems 2, 3. Full enumeration versus approximation by sampling. How many points should we use? How is the different from the sample size we used initially in the problem?)
3. We have to choose a specific population distribution, and choose a parameter value to start. In our theorems in math stat, we start from a more general situation. Why? What do we do with computer simulations to obtain more general knowledge (Problem 4. Use numerous different population distributions to start, numerous sample sizes.)
4. How do assess whether a distribution is close to normal? (Problem 4. Normal scores plots. Other methods mentioned.)
5. How do we compare a distribution to other theoretical distributions? (Problem 5. Understand the meaning of normal scores plots well enough to adapt to other distributions.)