**Chapter 7: Unbiased Estimators of Sampling Distributions**

We’ve investigated which estimators do the best job of estimating the maximum of a population in the German Tanks problem. Though some of the estimators did a pretty good job, they were still **biased** (i.e. they consistently over/underestimated the true maximum because the center (mean) of the sampling distribution is NOT equal to the true maximum parameter). There are a few statistics that do a consistently good job of estimating the population parameter. We call these **unbiased estimators**, or estimators for which the center (mean) of the sampling distribution is equal to the true parameter.

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| **Common Unbiased Estimators** | | | | | |
| **Parameter** | **Sample** | **Statistic** | **Mean of the sampling distribution of the statistic** | **Standard deviation of the sampling distribution of the statistic** | **Helpful Tools** |
| *p* | SRS of size *n* from a population of size *N.* |  |  | This formula is true only if the 10% condition for sample size is met: | **Normal approximation:**  If and  , then the sampling distribution of is approximately Normal. You can use the Normal distribution to calculate probabilities. |
| *μ* | SRS of size *n* from a population of size *N.* |  |  | This formula is true only if the 10% condition for sample size is met: | **Normal distribution:**  If the population is Normally distributed, then the sampling distribution of follows a Normal distribution. You can use the Normal distribution to calculate probabilities. |

Apply this knowledge! Try the following problems in the textbook:

p. 440 #35, 37, 39

p. 454 # 49, 51, 54