Homework Problem Set 9: Choosing a Sample Size

Note: In each problem I give the answer. You should be able to get the same results.

Replicating Mendel's Pea Study

Suppose we wanted to replicate Mendel's pea study described in an earlier set of homework problems. The goal is to estimate the probability (p) of an offspring with yellow peas using the proportion ($\hat{p}$) of offspring with yellow peas out of a sample of n observations.

1. Assume we want a confidence level of 95% and a margin of error of 0.05. Confirm that if we use $p = 0.75$ as a *good guess* of p then the sample size we should use is approximately 288, and that the *upper bound* on the sample size we should use is 384.

2. Assume we want a confidence level of 99% and a margin of error of 0.05. Confirm that if we use $p = 0.75$ as a *good guess* of p then the sample size we should use is approximately 498, and that the *upper bound* on the sample size we should use is 664.

Another Trebuchet Study

Recall the study of the trebuchet at Château des Baux described in a previous set of homework problems. In that study they fired the trebuchet 25 times and observed a mean distance of 250 meters with a standard deviation of 15 meters. This resulted in a margin of error of approximately 6.192 meters. Now suppose we wanted to conduct another study that would produce a smaller margin of error.

1. Confirm that the sample size necessary for a margin of error of approximately 3 meters with the same confidence level (95%) is approximately 96 if we use the sample standard deviation from this previous study as an estimate of σ. That is, we would need to fire the trebuchet approximately 96 times to produce a margin of error of 3 meters.

2. Confirm that the sample size necessary for a margin of error of approximately one meter with the same confidence level (95%) is approximately 864 if we use the sample standard deviation from this previous study as an estimate of σ. That is, we would need to fire the trebuchet approximately 864 times to produce a margin of error of one meter.