STAT 250 Midterm 2 Study Guide

# Chapter 8– Sampling Variability and Sampling Distributions

* Describe what a sampling variability is and what a sampling distribution is
  + Understand that the value of a sample statistic varies from sample to sample
  + Understand that a sampling distribution describes the sample-to-sample variability of a statistic
  + Understand how the standard deviation of the sampling distribution of a statistic is related to sample size
* Distinguish between a sample proportion and a population proportion and use correct notation for each
* Know the sampling distribution for a single proportion
  + Center
  + Spread
  + Shape – when is it approximately normal?
* Use the sampling distribution of to compute probabilities involving

# Chapter 9 – Estimating a Population Proportion

* Properties of a good estimator
  + Unbiased
  + Precise
* Know what margin of error is (interpretation), how it is computed for a single proportion, and how it is affected by sample size
* Define confidence interval and confidence level
* Know the general formula for a confidence interval
* Know and use the formula for a confidence interval for a single proportion
  + Under what conditions can you use the large sample confidence interval for a population proportion?
  + Carry out the EMCCC method
* Know how to get the critical value z\* for any confidence level
* Be firm in your interpretation of a confidence interval
  + Gives a range of plausible values for the population characteristic
  + The confidence level expresses our confidence in the method. The method will produce an interval that captures the true characteristic 95% of the time and misses it 5% of the time.
  + It is NOT a probability that the characteristic is in the interval. The characteristic is fixed. The sample we chose and interval we computed is what was random
* Know how varying confidence level and sample size affect the width of the interval.
* Compute the sample size needed to achieve a desired margin of error for a population proportion p at a desired level of confidence.

# Chapter 10 – Asking and Answering Questions about a Population Proportion

* Translate a research question into hypotheses – identify which population characteristic is of interest and determine the appropriate null and alternative hypotheses
* Interpret the results of a hypothesis test
  + Rejecting the null hypothesis implies strong support for the alternative hypothesis
  + Failing to reject the null hypothesis does NOT imply support for the null. Just means the observed data would be unsurprising if the null were true
* Know when it is appropriate to carry out the large-sample test for a population proportion
* Use the HMCCC method to carry out a large-sample test for a population proportion
  + Hypotheses – use appropriate notation
  + Method – (we’ve only learned two so far – a single proportion and a difference in two proportions)
  + Check Criteria – np0 and n(1-p0) both at least 10 and appropriate data collection
  + Compute – test statistic, p-value (for one and two-sided tests)
  + Communicate – compare P-value to alpha, state conclusion (reject/fail to reject), give conclusion in context of problem
* Interpret a P-value
* Know the types of errors that may occur in hypothesis testing
  + Be able to describe Type I and Type II errors in the context of the problem
  + Know how significance level of the test affects the probabilities of Type I and Type II errors and power
  + Know how sample size affects the probabilities of Type I and Type II errors and power
* Understand the reasoning used to reach a decision in hypothesis testing – Do the data “agree” with the null?
* Understand the difference between practical significance and statistical significance

# Chapter 11 – Asking and Answering Questions about a Difference in Population Proportions

* Know the general properties for the sampling distribution of a difference in two population proportions
  + Center/Mean
  + Spread/Standard Deviation
  + Conditions under which the shape is approximately normal
* Know how and when two implement a large-sample confidence interval for a difference in population proportions.
  + Conditions (data collection and sample size)
  + Formula for confidence interval – be sure you know SE()
  + Interpretation of interval and confidence level
* Know how and when to implement a large-sample hypothesis test for the difference in proportions
  + H – state hypotheses in terms of p1 and p2
  + M – method should still be pretty clear since we’ve only learned two so far
  + C – check that conditions are met – use numbers of successes and failures in samples to check sample size requirement
  + C – compute test statistic (here we use a combined estimate of p -pc in the standard error) and p-value
  + C – communicate conclusions: compare P-value to alpha, state conclusion (reject/fail to reject), give conclusion in context of problem