

If it is not clear what a question is asking, request clarification from the instructor. Misreading a question is not grounds for partial credit. To receive partial credit for the calculation problems, formulas and intermediate calculations must be legibly shown. A good strategy would be to go through and answer/set up as much of each calculation question as you can and then go back to fill in details. It is my experience that divine intervention seldom occurs during examinations.

The number preceding the question number is the point value of that particular question. Total points = 55.

(4) 1. In planning a sampling effort, we need to clearly identify the **objective** (after having specified the population of interest). This will always involve a statement of what population mean(s) and/or total(s) we want to estimate. For a statistically-based sample we should also explicitly state the _____ as part of the objective. We can then proceed to specify a sampling design, including appropriate sample size(s).

(10) 2. For our class hand span sampling example we saw that a sample size as small as three persons produced a satisfactorily precise estimate of class mean hand span. The same did not seem to be true if interest lie in estimating the proportion of females in the class. Coding females as 1s and males as 0s (and calling the coded values “y”) we find:

$$S_y^2 = 0.20; \quad \bar{y} = 0.27$$

If we wished to use simple random sampling without replacement to estimate the proportion of females with a desired standard error of 15 percent of the true proportion, how many persons (of the 22 total) would we need to observe?

(6) 3. Statisticians typically advise against systematic sampling of populations. Why are we, as natural resource professionals, often justifiably able to ignore that advice?

When should we **definitely not ignore** the statistician’s advice?

(6) 4. Using Excel to analyze a pps sample (taken with replacement) of $n=8$ units, you find the average and variance of your column of eight y_i/p_i values to be 10 and 100, respectively (using the Excel =average() and =var() functions). What is your estimate of the population total?

What is the standard error for the estimate of the population total?

(10) 5. The following is the summary of a stratified random sample (without replacement) of a population:

Stratum	N	n	\bar{y}	S_y^2	$S_{\bar{y}}$
1	50	3	5	19.947	?
2	200	17	20	11.891	0.8

Fill in the ?.

Provide a 90% confidence interval for the **population total** of y .

(6) 6. Refer again to question 5. What about the results suggests that stratified random sampling with the two strata is likely more efficient than simple random sampling of this population?

If we were to maintain a total sample size of 20 units, would those 20 units be allocated differently (than what was done) given an optimal allocation (with equal costs)? Why? (**DO NOT** do the calculation, just tell me generally)

(8) 7. Your company is looking at acquiring 100,000 acres of forestland. You need to assess the current volume of timber on the forest. The work is to all be done in the office with aerial photography and aerial photo volume tables (the tables estimate volume per acre of a stand given a density and height measurement obtainable from an aerial photo). A previous inventory of the forest (conducted by the current ownership 5-10 years ago) is available to you that lists stand number, stand location, stand acres, and volume per acre by species (at the time of the previous inventory) **for every stand in the forest.**

The simplest approach would be to select a simple random sample of stands for photo interpretation.

Why and **how** (define your variables) might you use regression/ratio sampling instead of simple random sampling?

Is double (two-phase) sampling needed? Why or why not?

How would you select stands for observation?

Is there a role for stratification in this situation as well? Explain?

(5) 8. Why is the standard error of the estimate with a double (two-phase) sampling technique (double sampling with a regression/ratio estimator or double sampling for stratification) larger than the standard error of the “parent technique”?