

Stat 31-5 Class Project Part IV: Sampling distributions of proportions and sample averages
& Inference

Assigned on Monday 12-01-03 and due on Monday 12-08-03

Name: _____

1. Binomial distribution, sampling distribution of proportions.

(a) Give an example of a random variable with distribution $B(100,0.75)$. Clearly state what the number of trials is, what a “success” is and the probability of success at each trial and check that it satisfies the binomial conditions.

(b) Give the mean and standard deviation of the random variable in (a)

(c) Find the exact probability of having no successes in all the trials (you do not need to use Excel)

- (d) Find the exact probability of having successes in all the trials (you do not need to use Excel)
- (e) Can you use the normal approximation to the binomial $B(100, 0.75)$ in this case? (Justify your answer)
- (f) What is the approximate sampling distribution of the proportion of successes (give the name of the distribution as well as mean and standard deviation). Find the approximate probability that the proportion of successes in your sample exceeds 0.80.
- (g) Find the exact probability (using Excel) that the proportion of successes in your sample exceeds 0.80.

2. Sampling distribution of Sample mean. Answer the first three parts of this question for one of the quantitative variables you collected

(a) What are all the assumptions (on your data) that you need to assume that the sampling distribution of the average \bar{x} of the quantitative variable in your sample is normal? (see assumptions to use the CLT)

(b) Are all those assumptions verified?

(c) Assume all assumptions are verified. If the population mean (resp. population standard deviation) of your variable is μ (resp. σ). Give the mean and standard deviation of the sampling distribution of \bar{x} .

(d) When is the sampling distribution of \bar{x} exactly normal?

3. Hypothesis testing on sample mean.

(a) State a hypothesis test you are interested in for one of your quantitative variables.

(b) Assume the population standard deviation of this variable is known (give a guess). Find a 99% confidence interval for the population mean of the variable.

(c) Using the same guess for the population standard deviation as in the previous part. Find the p-value of your test. What is your conclusion?

(d) Assuming the population standard deviation is unknown. Find the 99% confidence interval for the population mean of the variable, and find the p-value of your test. Do your conclusions change?