STAT 110A
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Name:_____

Quiz 6

Toxins. An investigation on toxins produced by molds that infect corn crops was performed. A biochemist prepared extrats of the mold culture with organic solvents and then measures the amount of toxic substance per gram of solution. From 6 preparations of the mold culture the following measurements of the toxic substance (in milligrams) are obtained: 3 2 5 3 2 6.

(a) Calculate the mean $\bar{X}$ and the standard deviation s from the data.

(b) Compute a 99% confidence interval for the mean weight of toxic substance per gram of mold culture. State the assumption you make about the population.

CLT. When you roll a fair die once you expect 3.5 points with a standard deviation of 1.708. (Variance 2.918).

Estimate the probability that in 1000 rollings of the die the total sum will be between 3500 and 3600 points.

Gain in a long run. (Your TA will explain this example) The gain in a game is described by random variable X given by

X	-1	0	5
p	0.2	0.2	0.6

(a) Would you play the game? Explain.

(b) If you play the game 100 times what is the probability of ending with a negative balance?

[Sol. $EX = 2.8, VarX = 7.36$, $\sigma X = 2.71, S = X_1 + \ldots + X_{100}$, S *is approx. normal (CLT),* $ES = 280, VarS = 736, \sigma S = 27.1$, $P(S < 0) = P(Z < \frac{0-280}{27.1}) = P(Z < -10.33) = 0$.*]*

EPA. The EPA standard on the amount of suspended solids discharged into rivers and streams is a maximum of 60 milligrams per liter daily, with a maximum monthly average of 30 milligrams per liter. Suppose you want to test a randomly selected sample of n water specimens and estimate the mean daily rate of pollution produced by the mining operation. If you want 95% confidence interval estimate of width 2 milligrams, how many specimens you need to sample? Assume prior knowledge indicates that pollution readings in water samples taken during a day are approximately normally distributed with a standard deviation equal to 5 milligrams.

You, the company statistician. You are designing a 99% confidence interval for the population mean. From earlier experience you know the estimate of the population standard deviation, $s = 0.25$. Your boss prefers short intervals, at most 0.01 in length, but he is concerned about the cost of the sampling.

Find the minimal sample size that will yield the desired interval.

Alcoholism. In a study to determine whether alcoholism has (in part) a genetic basis, genetic markers were observed for a group of 50 Caucasian alcoholics. For 5 alcoholics the antigen (marker) B15 was present. Estimate with 99% confidence interval the proportion of Caucasian alcoholics having this antigen. [0.017, 0.183]

Steaks. How large a sample would you require to determine a 95% confidence interval of length not more than 0.05 for the proportion of people in a given large group who prefer steak well done to rare?