**Applied Statistics I**

**Practice Exam II**
**(75 points total)**

1) **(30 points)** The random variable $X$ denotes the time in seconds taken for a file to be downloaded from the web. It is known that $X$ has a Normal distribution with mean $\mu = 65$ seconds and standard deviation $\sigma = 12$ seconds.

   a) Write the event "the file takes less than 1 minute to download" in terms of X.

   b) Find the probability of this event. Show your computations.

**Problem 1 (continued)**

c) In a single day, the file is downloaded 50 times. Assuming the download times to be a simple random sample of all download times, what is the sampling distribution of the mean of the 50 times?

d) What is the probability that the average of the 50 download times is less than one minute? Show your work.

**Problem 1 (continued)**

e) Find the level L such that there is probability only 0.10 that the mean $\bar{x}$ of the 50 download times falls above L.

f) Suppose that download times were, in fact, not Normal but were skewed right. Would the probability requested in d) be affected by the skewness? Briefly explain.

**2) (20 points)** The distribution of blood cholesterol level in the population of young men aged 20 to 34 years is close to Normal with standard deviation $\sigma = 41$ milligrams per deciliter (mg/dl).

a) You measure the blood cholesterol of 14 male cross-country runners. The mean level is $\bar{x} = 164$ mg/dl. Assuming that $\sigma$ for male cross-country runners is the same as in the general population of men aged 20 to 34 and that the cholesterol levels have a Normal distribution, compute a 92% confidence interval for the mean level $\mu$ among cross-country runners. Show computations including a picture like those we've used in class to show how you found $z^*$.

b) What condition not mentioned in a) is required for your computed interval to be valid?

**Problem 2 (continued)**

c) A student interprets 92% confidence as follows below. Explain briefly but clearly in what way this explanation is flawed.

> "If cholesterol levels were measured in 100 random samples of cross country runners, the intervals obtained from 92 of the samples would contain the mean of our sample."

**3) (25 points)** Continue to consider inference about cholesterol levels introduced in the previous problem. The mean blood cholesterol level for all men aged 20 to 34 years is $\mu = 188$ mg/dl.

a) Use the results of problem 2a) to test whether the mean for cross-country runners is lower than for the population of men aged 20 to 34 years. State hypotheses, carry out an appropriate test of significance, give the *P*-value and state your conclusion. Be sure you give a careful one-sentence interpretation of what the *p*-value means in this context.

**Problem 3a (continued)**

b) Briefly explain why the observed sample mean of $\bar{x} = 164$ is stronger evidence against the null in favor of the alternative hypothesis than a sample mean of $\bar{x} = 174$ would have been. (Note: You should not make any computations to answer this question.)