## Elementary Statistics

Test 3
Fall 2009
Name:
$12+10+4+10+10+10+10+10+10+14=100$
1 Let a random variable $X$ have a distribution (not necessarily normal) with mean 81 and standard deviation of 12. Assume the population is infinite. Consider taking a sample of size of 64 .

Answer the following questions.
(a) What is the distribution of $\bar{X}$ ?
(i) Shape or a name.
(ii) Mean.
(iii) Standard error of the mean.

Hint: Parts (ii) and (iii) require numerical answers.
(b) What is the name of the theorem you used in part 2?
(c) Find $P(\bar{X}<84)$. Also draw a graph and shade the area of interest.

A sample of 16 pieces of Manila rope of a certain diameter has a mean breaking strength of 41,250 pounds and a standard deviation of 1527 pounds. What can be said with $95 \%$ confidence about the maximum error if 41,250 is used as an estimate of the true average breaking strength of this kind of Manila ropes?

3 Randy and Susan are both members of a population of 60 students. A researcher is going to select 10 students from this population. What is the probability that Randy and Susan will be in a random sample?

4 A sample of 200 randomly selected customers shopped in a certain hardware store for an average of 19 minutes, with a standard deviation of 5.5 minutes. What can the store manager say about the average shopping time of customers with $99 \%$ confidence about the maximum error if the average of 19 minutes is used as an estimate of the shopping time of customers who patronize the store?

5 A park ranger wants to know the average size of trout taken from a certain lake. How large a sample of trout must be taken to be able to assert with probability of $98 \%$ that a sample mean ill not be off by more than half (0.5) an inch. Assume that it is known the standard deviation is 2.5 inches.

6 A hospital wants to estimate the mean number of blood tests given to patients each day. Hospital records show that a randomly selected sample of 90 days, the average number of blood tests was 85 , with a standard deviation of 9.2. Construct a $95 \%$ confidence interval for the mean number of blood tests given to patients each day.

7 If a random sample of 6 students took on the average 20.3 minutes with a standard deviation of 2.5 to complete the registration forms for courses offered in the next semester, construct a 95\% confidence interval for the mean time hat it takes to complete such registration forms.

8 In a sample survey, 140 out of 500 persons interviewed in a large city said that they shop in the downtown area at least once a week. Construct a $90 \%$ confidence interval for the corresponding true proportion.

9 In a sample survey, 320 of 1000 persons interviewed in a large city said that they shop in the downtown area at least once a week. What can we say with $99 \%$ confidence about the maximum error if we use the sample proportion to estimate the true proportion?

10 A large personal computer manufacturer wants to determine from a sample, what proportion of households intend to purchase personal computers within the next 12 months.
(a) How large a sample will the manufacturer need to be able to assert with a probability of $95 \%$ that the sample proportion will not differ from the true proportion by more than 0.05 ?
(b) Redo the problem if you know the true proportion is between 0.1 and 0.2 . (Give your best try. I will be easy on grading part (b))

