Sample Questions for Exam 3
Statistics 1, Fall 2008

1. A federally sponsored study involving 1364 children in 10 cities in the US found that "children who spent long hours in daycare and other types of non-maternal care tended to have more behavioral problems in kindergarten compared to children who were primarily taken care of by their mothers." (CBSNews.com April 20, 2001)
   a) Is this most likely an observational study or an experiment? Why?
   b) A reporter proposes the following headline for a newspaper story about this study: "Study Finds Long Hours in Daycare Cause of Aggressive Behavior." Explain why this headline is inappropriate.

2. Give three features of a good designed experiment and explain the purpose of each.

3. The distribution of the weights of boxes hauled by a trucking company has a mean of 40 pounds and a standard deviation of 6 pounds.
   a) What is the probability that the mean weight for a sample of 36 boxes is between 37 and 42 pounds, inclusive?
   b) The driver of a truck loaded with 900 boxes will be fined if the total weight of the boxes exceeds 36,450 pounds. Find the probability that the driver will be fined.
   c) Is it necessary to assume the population of box weights is normally distributed to do parts (a) and (b)?

4. Scores on a hearing test are normally distributed with a mean of 600 and a standard deviation of 100.

   a) If one subject is randomly selected, find the probability that the score is between 500 and 735.
   b) If a job requires a score in the top 20%, find the lowest acceptable score.(***this is the bet question, if everyone in the class gets one like it right on the exam, I will bring cookies.)
   c) If 50 subjects are randomly selected, find the probability that the ***sample mean*** score is over 615.

5. The manager at Dayton Machine Company measures arm lengths of a random sample of male machine operators, and the following values (in centimeters) are obtained.
   76.8 69.4 69.3 72.5 75.5 68.5 72.5 73.0
   (Hint: $\bar{x} = 72.1875$ and $s = 2.995$)

   a) Construct a 90% confidence interval for the population mean arm length of all male machine operators.
   b) Are any assumptions needed in part (a)? If so, specify them.
   c) What is the margin of error for the interval in part (a)?
   d) Are we guaranteed that the population mean will be in the interval in part (a)? Explain.
   e) If the confidence level is increased, does the interval become wider or narrower?
   f) How does increasing the sample size affect the width of a confidence interval? (All other components remain unchanged.)

6. 52% of the people in Haiti are literate. Suppose a random sample of 1000 Haitians is taken.
   a) What is the distribution of the sample proportion?
   b) What is the probability the sample proportion is
      i) between 0.49 and 0.53?
      ii) over 0.57?
   c) Give an interval where 99.7% of all sample proportions will fall.

7. Sketch the distribution of the sample means for each scenario.
   a) $n=64$, $\sigma=1$,$\mu=5$, population is skewed
   b) $n=16$, $\sigma=1$,$\mu=5$, population distribution is unknown
   c) $n=4$, $\sigma=1$,$\mu=5$, population is normally distributed