The exam is closed book. You may use a calculator, and one 8½ by 11 sheet of paper with formulas (or anything else) on it, but no other notes. Put all of your work on this test form (use the back if necessary).

Show your work or give an explanation of your answer. *No credit for numbers with no indication of where they came from.*

A tables of distributions are in a separate handout. Save the tables and bring them to the final exam.

There are 2 pages and 6 problems. The points total to 100.

1. [20 pts.] Let \( z \) be a random variable with a standard normal distribution.
   
   (a) What is \( P(z < 1.234) \)?
   
   (b) What is \( P(.56 < z < .78) \)?
   
   (c) What is \( z^* \) such that \( P(z < z^*) = .15 \)?

2. [20 pts.] Suppose a the lifetime of a light bulb can be modeled as a random variable \( x \) having a normal distribution with mean 900 hours and standard deviation 200 hours.
   
   (a) What fraction of light bulbs last longer than 1000 hours?
   
   (b) Suppose we want to replace light bulbs on a fixed schedule rather than whenever they burn out. What length of time should we leave the light bulbs in service so that on average 25\% (no more, no less) will burn out before being replaced?

3. [15 pts.] The probability of winning a bet on red at roulette is 18/38. A gambler makes 1000 such bets. What is the probability he wins more than he loses?

4. [15 pts.] A box of cereal has a stated net weight of 24 ounces. A sample of 50 boxes had a mean net weight of 23.64 ounces with standard deviation .15 ounces. Give a 95\% confidence interval for the true population mean net weight.
5. [15 pts.] A new drug is tried on 100 patients, which are considered a representative sample from the population of interest. The physicians involved in the study reported that the drug produced a cure in 78 of the 100 patients. Give a 95% confidence interval for the true population cure rate.

6. [15 pts.] Measurement of mouse weight for a sample of five mice gave statistics $\bar{x} = 84$ grams and $s = 15$ grams. We now want to find a sample size that will give us a 95% confidence interval with half width (the “plus or minus”) of one gram. What is the smallest $n$ we can use to get that accuracy?