Math 465 ASSIGNMENT 4 **Name:** _____

This assignment is due at the start of class on Wednesday, February 8th

I once read the following in *Time* magazine: "Research from the National Highway Traffic Safety Administration shows that up to 80% of crashes can be attributed to driver inattentiveness."

1. Assume that whether or not a crash is caused by inattentiveness is a Bernoulli process, with probability 0.80 as implied above. For each of the probabilities asked for, give the following, **connected by equal signs:**

   - A probability statement of the form $P(\textit{something about } X)$ for the desired probability
   - an expression (which might be a summation) involving the probability distribution function b that gives the desired probability
   - an expression involving the cumulative probability function B that gives the desired probability
   - the probability, as a decimal rounded correctly to four places past the decimal

   You can/should use your calculator, Excel or some other assistance to find the last of these. **For the first three, use the notation given in the book.**

   (a) The probability that 7 of ten recent crashes were due to inattentiveness.

   (b) The probability that 3 or 4 of five crashes are due to inattentiveness.

   (c) The probability that 10 or fewer of 15 crashes are due to inattentiveness.

   (d) the probability that 5 or more of eight crashes are due to inattentiveness.

2. In one year there are 427 crashes in a town. How many of those would we expect to be due to inattentiveness? What concept that we've studied does this illustrate?

3. Suppose that 100 Ω (ohm) resistors from a certain manufacturer actually have a mean of 99.92 Ω and standard deviation of 0.17 Ω. For each question below, give each of the following, **connected by equal signs:**

   - probability statement of the form $P(\textit{something about } X)$, followed by
   - an expression involving the cumulative normal distribution N with the above parameters that gives the desired probability, followed by
   - an equivalent expression involving the cumulative **standard** normal distribution $N(z; 0, 1)$ that gives the desired probability, followed by
   - the desired probability, to four places past the decimal.

   Find the probability that a randomly selected resistor has resistance

   (a) over 100 Ω.

   (b) less than 99.7 Ω.

   (c) between 99.8 and 100.2 Ω.

4. Here is a typical sort of problem that we will run into: Suppose that five resistors are to be selected from a very large batch of resistors. Because the batch is large we can treat this as a Bernoulli experiment, even though we are drawing without replacement. Find the probability that two of the five have resistances under 99.75 Ω. **Indicate clearly, using appropriate notation, how you obtain your answer. Hint:** You first need to apply the normal distribution to find the probability of any randomly selected resistor having a resistance of less than 99 ohms, then apply the binomial distribution with that probability