MATH 302 WORKSHEET VII SPRING 2009 NAME:_____
(PLEASE PRINT LEGIBLY)

Even though it is terribly amusing and rewarding to do all of the approximations for the probabilities using Z, T, F, or χ^2 tables, we can use Maple to get approximations for probabilities.

1. Suppose X_1, X_2, X_3, X_4 is a random sample from an $N(x, \mu_X = 50, \sigma_X = 14)$.
Find the approximate probability that $\Pr(43 \leq \overline{X} \leq 71)$ using Maple.

2. Suppose X_1, X_2, X_3, X_4 is a random sample from an $N(x, \mu_X = 50, \sigma_X = 14)$.
Find the approximate probability that $\Pr(0.5248 \leq \frac{S_X^2}{\sigma_X^2} \leq 1.62584)$ using Maple.

3. Let $X_1, X_2, X_3, X_4, \ldots, X_{16}$ is an i.i.d. from a distribution that we don't know (but assume it is continuous) and suppose we found S_X where $S_X = 2^1/_{10}$. Approximate $\Pr(\overline{X} \leq 13^1/_4)$ using Maple.

4. Let $X_1, X_2, X_3, X_4, \ldots, X_{16}$ is an i.i.d. from a distribution that we don't know (but assume it is continuous) and suppose we found an $\overline{X}$ and S_X where $\overline{X} = 12 \wedge S_X = 2^1/_{10}$. Find $\Pr(\overline{X} > 13^1/_4)$.

5A. Suppose we select a random sample of 40 wheat farmers in the Midwest and record the amount (X) that it costs per bushel to produce their crop. Prior experience has shown that, in the Midwest, the relative frequency distribution of production cost per bushel of wheat has a mean of $3.25 and a standard deviation of $0.45. What is the approximate probability that the average production cost per bushel in the sample will be between $3.30 and $3.45? Suppose one assumes μ = $3.25 and σ = $0.45.

5B. Suppose we select a random sample of 40 wheat farmers in the Midwest and record the amount (X) that it costs per bushel to produce their crop. Prior experience has shown that, in the Midwest, the relative frequency distribution of production cost per bushel of wheat has a mean of $3.25 and a standard deviation of $0.45. What is the approximate probability that the average production cost per bushel in the sample will be between $3.30 and $3.45? Suppose one assumes μ = $3.25 and S = $0.45.

5C. Suppose we select a random sample of 40 wheat farmers in the Midwest and record the amount (X) that it costs per bushel to produce their crop. Prior experience has shown that, in the Midwest, the relative frequency distribution of production cost per bushel of wheat has a mean of $3.25 and a standard deviation of $0.45. What is the approximate probability that the average production cost per bushel in the sample will be between $3.30 and $3.45? Suppose one assumes μ = $3.25 and $\hat{\sigma}$ = $0.45.

6. Suppose we select a random sample of 40 wheat farmers in the Midwest and record the amount (X) that it costs per bushel to produce their crop. Prior experience has shown that, in the Midwest, the relative frequency distribution of production cost per bushel of wheat has a mean of μ = $3.25 and a standard deviation of $0.45. What is the approximate probability that the average production cost per bushel in the sample will be less than $3.30?

7. In an investigation of the cost of a major national child immunization programme, financial data from surveying each of the 50 states and DC for the period 1990 - 1995 indicates that that the average cost of the immunization programme per census track is $22,500 and the standard deviation is $6,000. Suppose instead of using all such data this year we are going to randomly sample from all the census tracks in the United States and get a random sample of 30 census tracks. What is the approximate probability that the average cost to administer the immunization programme is between $20,000 and $25,000?

8. The manager of a supermarket wants to know if the 'cents off' coupon used in his store is in line with usage nationally. Studies have shown that 62% of all shoppers nationally use the coupons. If this percentage holds in his store, 500 randomly selected shoppers in the store are monitored, and you are doing the statistics for him (since he graduated from Auburn with a Political Science degree and hence can't do mathematics or statistics, can't find a job that is 'in line' with his degree, and can't even figure out how to use SPSS, so is working in a supermarket and asking you for help) what is the approximate probability that 65% of the monitored shoppers use the coupons?

9. Let $X_1, X_2, X_3, X_4, \ldots, X_{10}$ is an i.i.d. from a $N(x, \mu_X, \sigma_X)$ distribution and $Y_1, Y_2, Y_3, \ldots, Y_{15}$ is an i.i.d. from a $N(y, \mu_Y, \sigma_Y)$ distribution whilst $\sigma_X = \sigma_Y$

Approximate $\Pr\left(\frac{S_X^2}{S_Y^2} \leq 4.03\right)$ using Maple.