Math 341. Extra Homework. Due Friday 8, December, 2000.

Name: .... **Prof.** ....

Show all your work. No credit for lucky answers.

1. An elevator can carry a maximum of 1575 pounds. What is the probability that 10 people will overload the elevator if their weights are random selections (independent identically distributed random variables)) from a normal distribution with mean 150 pounds and variance 10 pounds^2.

2. A random sample of size $n = 18$ is taken from the distribution with density function

$$f(x) = \begin{cases} 1 - \frac{x}{2} & \text{if } 0 < x < 2 \\ 0 & \text{otherwise} \end{cases}$$

Find the expected value and the variance of $\bar{x}$. Find, approximately $P(\frac{2}{3} \leq \bar{x} \leq \frac{5}{6})$.

3. Traffic accidents at an intersection follow a Poisson distribution with 40 accidents expected per year. Use Minitab to the find the probability that there are at most 55 accidents in that intersection. Use the normal approximation and normal tables to estimate the probability that there are at most 55 accidents in that intersection. Compare those two probabilities.

4. It is claimed than 75 % of all dentists recommend a certain brand of gum for their gum chewing patients. A consumer group doubted this claim believing that the proportion is lower and decided made a sample survey. A survey of 390 dentists found that 273 recommended this brand of gum. What are the null and alternative hypothesis? Find the p value of the test. Which hypothesis would you accept if the significance level is (a) $\alpha = 0.10$? (b) $\alpha = 0.05$? (c) $\alpha = 0.01$?

5. Assume that IQ scores for a certain population are approximately normally distributed with mean μ and variance 100. To test $H_0 : \mu = 110$ against the one–sided alternative hypothesis $H_a : \mu > 110$, we take a random sample of size $n = 16$ from this population and observe $\bar{y} = 113.5$. Find the p value of the test. Which hypothesis would you accept if the significance level is (a) $\alpha = 0.10$? (b) $\alpha = 0.05$? (c) $\alpha = 0.01$?

6. Let Y equal the number of pounds of butterfat produced by a Holstein cow during the 305–day milking period following the birth of a calf. We assume that the distribution

of Y is normal with mean μ and variance σ^2. The following data was obtained:

425	710	661	664	732	714	934	761	744
653	725	657	421	573	535	602	537	
405	874	791	721	849	567	468	975	

Test the null hypothesis $H_0 : \sigma^2 = 140^2$ against the alternative $H_a : \sigma^2 > 140^2$ at the levels (a) $\alpha = 0.10$? (b) $\alpha = 0.05$? (c) $\alpha = 0.01$? Find the p–value of the data.

7. To test $H_0 : \mu = 335$ against $H_1 : \mu < 335$, under normal assumptions, a random sample of size 17 yielded $\bar{x} = 324.8$ and $s = 40$. Would you reject the null hypothesis if the significance level is (a) $\alpha = 0.10$? (b) $\alpha = 0.05$? (c) $\alpha = 0.01$? Calculate the p-value of the test.

8. A farm grows grapes for jelly. The following data are measurements fo sugar in the grapes of a sample take from each of 39 truckloads:

16.0	15.2	12.0	16.9	14.4	16.3	15.6	12.9	15.3	15.1
15.8	15.5	12.5	14.5	14.9	15.1	16.0	12.5	14.3	15.4
15.4	13.0	12.6	14.9	15.1	15.3	12.4	17.2	14.7	14.8

Assume that there are observations of a $N(\mu, \sigma^2)$. Find point estimates for μ and σ^2. Find an approximate 90 % confidence interval for μ. Find an approximate 95 % confidence interval for σ^2.

9. In a random sample of 24 Black Angus steers of certain age have a standard deviation of 238 pounds. Assuming that the weights constitute a random sample from a normal population, find a 95 % confidence interval for σ^2.

10. In a random sample of 300 persons eating lunch at a department store cafeteria, only 102 had dessert. Find a 95 % confidence interval for p, the proportion of people which eat dessert.