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STA 3032
Section 4436
Exam #1
Fall, 2008

1. Highway paving material is a mix of asphalt, sand, gypsum, and other ingredients. Several "batches" of paving material are mixed each day. Asphalt content differs from batch to batch, with a normal distribution that has mean 100 lb per ton and standard deviation 6 lb per ton.

a. (15 pts) Sketch a graph that represents the distribution (probability density function) of asphalt content over batches.

|______|_____|______|_____|______|_____|______|_____|______|_____|______
80 85 90 95 100 105 110 115 120 125 130

b. (15 pts) What is the probability that the asphalt content in a single batch will exceed (be greater than) 106 lbs per ton?

$$X \sim N(100,36)$$

$$P(X > 106) = P\left(\frac{X-100}{6} > \frac{106-100}{6}\right) = P(Z > 1) = .16$$

2. (20) A random sample of 36 trees from an orange grove produced an average yield of 2.85 boxes per tree and a standard deviation of .3. Set up a 95% confidence interval for the average yield per tree in the entire grove.

N/A

3. Short answer and true-false (3 pts each):

a. (**T** or F) If you computed both 90% and 95% confidence intervals for a mean, then the 90% interval would be a subset of the 95% interval.

b. (**T** or F) The normal distribution is a symmetric distribution.

c. (**T** or F) The mean of the distribution of weight measurements of UF students would be larger than the standard deviation.

d. (**T** or F) The mean and median of a normal distribution are equal.

h. (T or **F**) The Poisson distribution is continuous.

e. According to the Central Limit Theorem, if is the variance of the observations, then the variance of the sampling distribution of the sample mean $\bar{X}$ is equal to $\underline{\sigma^2/n.}$

f. The difference between the 25th and the 75th percentiles is called the <u>interquartile range</u>.

g. Standard deviation and range are measures of <u>dispersion or variation</u> in a set of data.

h. Two events, A and B, are independent if <u>P(A|B) = P(A)</u>.

i. Assume P(A)=.5, P(B)=.4, and P(A∩B)=.2. Find P(AUB)=<u>.5+.4-.2=.7</u>.

4. (20) You are in charge of a computer lab that has 100 computers, all of the same make and age. All computers are shut down at the end of the day and restarted the next day. Each computer has a 1% chance of failing to start on any given morning. The computers operate independently. What is the probability that more than 2 of the computers will fail to start on a particular morning?

$X = \#$ of computers that fail to start. Then $X \sim Bin(100, .01)$.

$$P(X > 2) = 1 - P(X \leq 2) = 1 - [P(X = 0) + P(X = 1) + P(X = 2)]$$

$$= 1 - [(.99)^{100} + 100(.01)(.99)^{99} + \left(\frac{100 \cdot 99}{2}\right)(.01)^2(.99)^{98}$$