Stat/For/Hort 571 **Yandell and Zhu** **October 7, 2003**

Midterm I

Name:____

For the section that you *attend* please indicate:

Instructor:(circle one) Yandell Zhu

TA: (circle one) Cheng Kozloski Wang

Instructions:

1. This exam is open book. You may use textbooks, notebooks, class notes, and a calculator.
2. Do all your work in the spaces provided. If you need additional space, use the back of the preceding page, indicating *clearly* that you have done so.
3. To get full credit, you must show your work. Partial credit will be awarded.
4. Do not dwell too long on any one question. Answer as many questions as you can.
5. Note that some questions have multiple parts. For some questions, these parts are independent, and so you can work on part (b) or (c) separately from part (a).

For graders' use:

Question	Possible Points	Score
1	20	
2	30	
3	30	
4	20	
Total	100	

1. A study was conducted to determine the soil-water-infiltration in several fields in May. The data consist of the soil-water-infiltration measurements (in `cm`) as follows.

   `16, 8, 14, 13, 17, 11, 7, 21, 14, 4`

   (a) Construct a stem and leaf display for the soil-water-infiltration data.

   (b) Compute the interquartile range (IQR) for the soil-water-infiltration data.

2. Two domestic dogs, Habibi and Spotty, may bark when a stranger is at the front gate of the house. There is a 0.5 chance that Habibi barks and a 0.7 chance that Spotty barks. Assume that Habibi behaves independently of Spotty.

   (a) What is the probability that both Habibi and Spotty bark, when a stranger is at the front gate of the house?

   (b) Compute the probability that at least one dog barks, when a stranger is at the front gate of the house.

   (c) Let Y denote the number of dogs that bark, when a stranger is at the front gate of the house. Compute $E(Y)$ and $Var(Y)$.

3. Let $Y_1, \ldots, Y_n \sim N(20, 9)$. Recall that the sample mean is $\bar{Y} = \frac{1}{n}\sum_{i=1}^{n} Y_i$ and the sample variance is $S^2 = \frac{1}{n-1}\sum_{i=1}^{n}(Y_i - \bar{Y})^2$.

   (a) If $n = 10$, compute $P(8.34 \leq S^2 \leq 14.68)$.

   (b) If $n = 10$, find y^* such that $P(\bar{Y} \leq y^*) = 0.95$.

   (c) The following italicized statement is either True or False. Indicate whether it is True or False and explain your choice.

   For any new sample of a size larger than 10, the value of y such that $P(\bar{Y} \leq y) = 0.95$ will be larger than the value of y^* in part (b).

4. It is known that the proportion of plants infected by aphids is 10% in a soybean field in the early spring.

   (a) Suppose 15 plants are randomly selected from the field. What is the probability that at least 1 plant is infected by aphids?

   (b) Suppose 150 plants are randomly selected from the field. Let W denote the number of plants that are infected among the 150 plants. Find a such that $P(W \geq a) = 0.90$.