Monday, March 26^{th}, 2001

STAT 225

Spring 2001

Midterm 2 (alternative)

NAME:

1. Choose an American household at random and let the random variable X be the number of persons living in the household. If we ignore the few households with more than seven inhabitants, the probability distribution of X is as follows:

Inhabitants	1	2	3	4	5	6	7
Probability	.2	?	.2	.17	.11	.05	.03

(a) What must be the proportion of two-person households, *P(X=2)*, in order for this to be a legitimate probability distribution ?

(b) What is $P(1 < X \leq 5)$

(c) What is the expected size of a household

(d) What is the standard deviation

(e) What Percentage of households are within 2 standard deviations of the mean household size

2. You observe an old slot machine. The first wheel on the machine has 40 symbols, one of which is a cherry. All symbols are equally likely to come up on any spin, and spins are independent of each other.

(a) If you look only to the first wheel how many spins do you have to wait on the average to see the first cherry?

(b) How many cherries on the average will you see in 100 spins

(c) What is the probability that the 3rd cherry appears on the 27th spin?

(d) What is the probability that exactly 3 cherries appeared in the last 20 spins given that at least two cherries appeared in the last 20 spins?

3. You pay \$4 to play a game that consists of rolling a pair of fair six sided dice with faces numbered $\{1,2,3,4,5,6\}$. For each time you roll the dice and a pair does not turn up you win \$1. The game ends when a pair turns up.

(a) What is the distribution of X, the number of rolls until a pair comes up?

(b) Let Y be the random variable defined as your net winning for a single play. Express Y in terms of X.

(c) What is the expected value and variance of your net winnings for a single play?

4. The number of deer crossing I65 at a given mile marker has a Poisson distribution with mean 0.3 per day.

(a) On a given day, what is the probability of seeing more than 2 deer?

(b) What is the distribution of the number of deer crossing per week?

(c) If you watched for the next 10 days, what is the probability you would not see any deer on at most one of the days?

5. Daily CPU time used by the Statistics Department at Purdue University is a random variable (measured in hours) with the probability density function:

$$f(x) = \begin{cases} \dfrac{3}{64} x^2 (4 - x), & \text{for} \quad 0 \le x \le 4 \\ 0, & \text{elsewhere} \end{cases}$$

(a) Find the expected value of daily CPU time

(b) What is the time that is bigger than a daily CPU time in 75% of the cases?