Midterm 1A–Stat 100–Spring 1997

You may use calculators, but not books or notes. Each problem is worth 20 points. Different parts of a problem have equal weight unless otherwise indicated. Do not spend too much time on any one problem. Put a box around the final answer to a question.

1. (a) (15 pts.) For the data $2, 5, 5, 2, 3$, calculate the sample mean, the sample standard deviation, and the median .
(b) (5 pts.) Suppose that data $x_1, x_2, \ldots x_n$ has sample mean equal to 6. What is the sample mean of the data $x_1 + 3,\ x_2 + 3,\ \ldots\ x_n + 3$?

2. Let the sample space $S = \{e_1, e_2, e_3, e_4, e_5, e_6\}$. Suppose $P(e_1) = P(e_2) = .2$ and $P(e_3) = P(e_4) = .05$, and suppose e_5 and e_6 are equally likely. Consider the events $A = \{e_1, e_4, e_5\},\ B = \{e_2, e_4, e_5, e_6\}$.
a. Find $P(e_5)$.
b. Find $P(A\overline{B})$.
c. Find $P(A|B)$.
d. Are A and B independent? Why or why not?

3. From a group of 25 cities, 4 will be randomly selected for a new pollution study. Of the 25 cities, 4 have traditionally had high pollution, 15 have had moderate pollution, and 6 have had low pollution.
(a) What is the probability that 4 high-pollution cities will be selected?
(b) Find the probability that 2 low-pollution cities and 2 high-pollution cities will be selected.

4. For cars visiting a certain county park, assume that X, the number of people in a car, has the following probability distribution.

n	1	2	3	4	5	6 or more
$P([X = n])$	0.1	0.2	0.4	0.2	0.1	0

a. What is the probability that a car contains just one or two people?
b. Compute E(X), the expected number of people in a car.
c. What is the standard deviation of the number of people in a car?
d. If park officials plan to admit a certain number of cars with the aim of admitting approximately 1200 people, then how many cars should they admit to the park?

5. Let X denote the face shown by a loaded die, and assume the probability distribution is

n	1	2	3	4	5	6
$P([X = n])$	0.2	0.2	0.3	0.1	0.1	0.1

Suppose we roll this die 20 times. Find the probabilities of the following events.

a. Face "3" appears on both the 10th and 11th rolls.
b. Face "3" shows up no more than 5 times.
c. Face "3" shows up exactly 7 times.
d. Face "3" shows up at least 8 times.