FINAL EXAM–STAT 100–FALL 1996

You may use calculators and ONE page of notes. Each problem is worth 20 points. Do not spend too much time on any one problem. Put a box around the final answer to a question. THERE ARE MORE QUESTIONS ON THE BACK.

1. Six parents had the following numbers of children: 1, 2, 2, 3, 7, 3 .
(a) (8 pts.) Determine the sample mean and median number of children.
(b) (6 pts.) Determine the sample standard deviation.
(c) (6 pts.) Graph a histogram for this data. For the bins (bases of rectangles), use intervals [.5, 1.5), [1.5, 2.5), [2.5, 3.5), etc. Indicate the scale on the y-axis.

2. A sample space is the union of events A, B, C. Suppose
the events B and C are mutually exclusive; $\mathrm{P}(B\overline{C}) = .2$;
A and B are independent and $\mathrm{P}(AB) = .12$; $\mathrm{P}(C|A) = 0$.
Now determine the probabilities below.
(a) $\mathrm{P}(B)$ (b) $\mathrm{P}(A)$ (c) $\mathrm{P}(A \cup B)$ (d) $\mathrm{P}(AC)$ (e) $\mathrm{P}(C)$

3. Suppose a discrete random variable X has the probability distribution:
$\mathrm{f}(0) = .5,\ \mathrm{f}(1) = .2,\ \mathrm{f}(2) = .3$. (Here, $\mathrm{f}(x)$ denotes $\mathrm{Prob}(X = x)$.)
Compute the mean and standard deviation of X.

4. (a) In her morning commute, a professor passes through an intersection at which the traffic light is red with probability .3 . What is the probability she will hit 10 or more red lights in 18 working days?

(b) Albert flips a fair coin 100 times. Approximately what is the probability that the number of heads he gets is 40 or less? Justify your answer.

5. The distribution of personal income among workers in a certain industry has mean \$52,000 and standard deviation \$4,000. Approximately what is the probability that in a random sample of 100 workers the average income would exceed \$53,000?

6. A teacher claims that students at his University would have average score at least 75 on a certain national exam. A random sample of 100 students at his University score with average 78 and sample standard deviation 14. Is this strong evidence for the teacher's claim?

Formulate this problem as a hypothesis test with level of significance $\alpha = .025$. State null and alternate hypotheses, test statistic and rejection region. Give an assumption or explanation which justifies your procedure.

7. Measurements of aerobic capacities are recorded for a group of 20 Peruvian native highlanders and a group of 10 U.S. lowlanders acclimatized as adults in high altitudes. The following summary statistics were obtained from the data.

	Peruvian Highlanders	U.S. Lowlanders
Mean	46.3	38.5
Standard deviation	5.0	5.8

(a) Construct a 95% confidence interval for the mean difference in aerobic capacity between the two groups.
(b) Give appropriate assumptions which justify your procedure.
Does the reasonableness of any assumption depend on the summary statistics?

8. (a) Suppose the null hypothesis is rejected at significance level $\alpha = .05$.
What, if anything, can you deduce about the possibilites for the P-value?
Very briefly explain.

(b) You are allowed to roll a fair die 10 times, and then you are given X dollars, where X is the total of your 10 throws. What is the expected value of X?

9. A new pumpkin fertilizer is tested. The new and old fertilizers are used on pumpkins in four soil types A,B,C,D. The weight in pounds of the pumpkins after eight weeks of growth is recorded below.

Soil type	A	B	C	D
New fertilizer	3	0	7	8
Old fertilizer	2	0	5	7

For a suitable test, is there evidence at the .05 level of significance that the new fertilizer is better than the old one?

10. An M&M producer claims that the colors of M&M's occur in equal proportions. A Stat 100 student wants strong evidence to dispute the claim. The student randomly samples 1,000 M&M's from different stores, and obtains the counts below of the colors red (R), orange (O), yellow (Y), green (G) and blue (B).

Color	R	O	Y	G	B	TOTAL
Count	210	230	190	180	190	1000

Determine with a suitable test whether the producer's claim is rejected at level of significance .05.