Math 230   Exam 2   Name_____
April 8, 1999

Instructions: Answer each question to the best of your ability. Most
questions require that you give a concluding or summary statement. These
statements should be complete sentences. Good Luck!!!

1.   (3.4) You are on the staff of a member of Congress who is considering a
bill that would provide government-sponsored insurance for nursing home care.
You report that 1128 letters have been received on the issue, of which 871
oppose the legislation. "I'm surprised that most of my constituents oppose
the bill. I thought it would be quite popular," says the congresswoman. Are
you convinced that a majority of the voters oppose the bill? How would you
explain the statistical issue to the congresswoman?

2.   Just before a presidential election, a national opinion polling firm
increases the size of its weekly sample from the usual 1500 people to 4000
people.

a)   Does the larger random sample reduce bias of the poll result? Explain!

b)   Does it improve the precision of the result? Explain!

3.   (3.39) Fizz Laboratories, a pharmaceutical company, has developed a new pain-relief medication. Sixty patients suffering from arthritis and needing pain relief are available. Each patient will be treated and asked an hour later, "About what percentage of pain relief did you experience?"

(a)   Why should Fizz not simply administer the new drug and record the patients' responses?

(b)   Outline the design of an experiment to compare the drug's effectiveness with that of aspirin and of a placebo.

(c)   Should patients be told which drug they are receiving? How would this knowledge probably affect their reactions?

(d)   If patients are not told which treatment they are receiving, the experiment is single-blind. Should this experiment be double-blind also? Explain!

(e)   Choosing the most effect size of the treatment groups requires more statistical expertise. We will learn more about this aspect of design is later chapters. Explain in plain language the advantage of using larger groups of subjects.

4.   (4.9) The Internal Revenue Service plans to examine an SRS of individual federal income tax returns from each state. One variable of interest is the proportion of returns claiming itemized deductions. The total number of tax returns in a state varies from almost 14 million in California to fewer than 210,000 in Wyoming.

(a)   Will the sampling variability of the sample proportion change from state to state if an SRS of 2000 tax returns is selected in each state? Explain your answer.

(b)   Will the sampling variability of the sample proportion change from state to state if an SRS of 1% of all tax returns is selected in each state? Explain your answer.

5.   (4.13) If you draw an M&M candy at random from a bag of candies, the candy you draw will have one of six colors (before the new blue was added). The probability of drawing each color depends on the proportion of each color among all candies made. The table below give the probabilities that a random chosen M&M has each color.

Color	Brown	Red	Yellow	Green	Orange	Tan
Probability	0.3	0.2	0.2	0.1	0.1	?

a)   What must be the probability of drawing a tan candy?

b)   What is the probability that the candy drawn is any of red, yellow, or orange?

6.   To predict the inventory required for a particular type of CD player, a stereo dealer analyzed the weekly number of sales over a long period of time. The appropriate probability distribution of the number, X, of sales per week is shown in the table. (Use the accompanying Minitab)

x	0	1	2	3	4	5	6	7
P(X = x)	.01	.07	.18	.34	.24	.12	.03	.01

a)   Find the expected number, μ, of sales per week.

b)   Find σ^2 and σ.

```
MTB > print c1 c2
x (c1)
      0      1      2      3      4      5      6      7
p(x) (c2)
    0.01   0.07   0.18   0.34   0.24   0.12   0.03   0.01

MTB > let c3=c1*c2
MTB > sum c3 k1

   Sum of C3      =      3.2600
MTB > let c4=(c1-k1)**2
MTB > sum c4 k2

   Sum of C4      =      42.461
MTB > let k3=sqrt(k2)
MTB > print k1 k2 k3

Data Display

K1        3.26000
K2        42.4608
K3        6.51619
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7.   An opinion poll asks an simple random sample of 1500 adults, "Do you happen to jog?" Suppose (as is approximately correct) that the population proportion who jog is p = 0.15.   In a large number of samples, the proportion $\hat{p}$ who answer "Yes" will be approximately normally distributed with mean 0.15 and standard deviation 0.009. **Carefully sketch this normal curve** and use it (and Table A) to answer these questions:

a)   What percent of many samples will have a sample proportion who jog that is 0.15 or less?

b)   What is the probability that $\hat{p}$ will take a value between 0.141 and 0.159?

c)   What is the probability that $\hat{p}$ does not lie between 0.141 and 0.159?

d)   What is the probability that $\hat{p}$ would be greater than 0.159?

8.   The systolic blood pressure of a random sample of 100 female students has sample mean $\overline{X}$ = 116.80. If the standard deviation of blood pressure for the entire population of females students is assumed to be 20,

a)   find a 90% confidence interval for the mean blood pressure in the population.

       Assume that a 90% confidence interval for the mean blood pressure in the population has been calculated based on a known population standard deviation of 20.   State whether the following would increase or decrease the width of the confidence interval.   Briefly state why.

b)   The confidence level is changed to 95%.

c)   The population standard deviation is found to be 15 rather than 20.

d)   A sample of only 50 female students is measured.

9.   Short Answer or Multiple Choice

a)   A new teaching method is tried on a large class. At the end of the course, a final is given. The average score is 73 out of 100 and only 3% of the class failed. Does this show the new method was successful?
Explain.

b)   In October, 1976, a nationwide vaccination program was started against swine flu. The first shots were given to the group most at risk - the elderly and infirm. During the first week of the program, 24,000 persons aged 65 and over were given shots, and three of these persons died. As a result, eight states suspended the vaccination program. What would a statistician (you) say?

c).   If X_1, X_2, L, X_{16} is a random sample from a normal distribution with mean 18 and standard deviation 64, then $\overline{X}$ will have

a)   What distribution?
b)   What mean?
c)   What standard deviation?

d).   You notice that your car seems to run better when you use Brand A of gasoline than when you use Brand B. Can you conclude that Brand A is better than Brand B for you Car?
a)   Yes. This is a simple random sample.
b)   No. The evidence is anecdotal.
c)   Yes. This is a comparative experiment.
d)   No. The two brands are the same.
e)   None of the above.

e).   A new headache remedy is given to a group of 25 patients who suffer severe headaches. Of these, 20 report that the remedy is very helpful in treating their headaches. From this information you conclude
a)   the remedy is effective for the treatment of headaches.
b)   nothing, because the sample size is too small.
c)   nothing, because there is no control group for comparison.
d)   the new treatment is better than aspirin.
e)   none of the above.

f).   A randomly selected student is asked to respond yes, no, or maybe to the question: "Do you intend to vote in the next presidential election?" The sample space is {yes, no, maybe}. Which of the following represent a legitimate assignment of probabilities for this sample space?
a)   .4, .4, .2
b)   .4, .6, .4
c)   .3, .3, .3
d)   .5, .7, -.2
e)   none of the above.

g).   You want to compute a 95% confidence interval for a population mean. Assume that the population standard deviation is known to be 10 and the sample size is 50. The value of z^* to be used in this calculation is
a)   1.645
b)   2.009
c)   1.96
d)   .8289
e)   .8352