MATH 210 - Test #2 - 10/19/00

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Show all work for full credit. Points in [brackets] sum to 100.

1. The following table provides the probability distribution for the years it takes for students to complete their college degree at a major university.

Years (X)	3	4	5	6	7
Prob. (P)	.05	.80	.08	___	.02

a. What is the probability for finishing in exactly 6 years? **Explain!**
[4]

b. What is the probability that a student requires more than 4 years to graduate?
[4]

c. You are going to pick four graduates "at random" from this university. What is the probability that *none* of them required *more than* 4 years?
[4]

d. What is the expected (that is, mean) number of years required to graduate at this university?
[8]

e. If you pick ten graduates "at random" and compute the mean time it took for them to graduate would it necessarily be close to your answer to (d)? Explain, including a reference to the *Law of Large Numbers*.
[4]

2. You are going to choose an SRS of 20 graduates from the university in Question #1 and count the number who took more than four years to graduate.

a. Show how this can be set up as a binomial experiment by defining the following components. Give *specific values* for *n* and *p* and a *description* for SUCCESS and *X*. **These must be defined *in the context of this problem*.**

[8]

n =

SUCCESS is ...

X represents ...

p =

b. What is the mean number of people (out of 20) who require more than four years?

[3]

c. What is the standard deviation in the number of people requiring more than four years?

[3]

d. Determine the probability that exactly half of your sample required more than four years.

[3]

e. Suppose you choose a sample of 100 graduates. Find the probability that more than 20 of them required more than four years. **Be sure to justify the method you use!**

[10]

3. The mean amount spent per visit by customers at your gift shop is \$18, with a standard deviation of \$7. You pick an SRS of 60 sales from this month's receipts. What is the probability that the mean amount for your sample is *between* \$16 and \$20? **Be sure to justify the method you use!**

[10]

4. The following table classifies this week's customers at your gift shop, by sex and age (in years).

[16]

		10–29	30–49	50–69	70–89		Total
MALE	150	550	400	100		1200	
FEMALE		100	100	250	50		500
Total		250	650	650	150		

You plan to choose a customer "at random" to receive a free gift.

a. What is the probability the person chosen is female?

b. What is the probability the person chosen is female and from 30 to 49 years of age?

c. If you know the person chosen is in the 30–49 age group, what is the probability they are female?

d. Is it fair to say that a customer's sex is independent of their age? **Support your answer using specific numbers!**

5. Miscellaneous

a. In a binomial experiment, the sample proportion will tend to be closer to (p , X, 0 , p̂) when a larger sample is used. (Circle *one* of the four choices.)

[3]

b. The "Central Limit Theorem" states that for sufficiently large samples, the sample mean 0 will: (circle *one*)

[3]

- < be close to the population mean
- < follow a binomial distribution
- < be approximately normal
- < have greater variation

c. In a binomial experiment, the standard deviation in X: (circle *one*)

[3]

- < is independent of the sample size
- < decreases for larger samples
- < increases for larger samples
- < is constant

d. In a *uniform* distribution: (circle *all* that are correct)

[4]

- < probabilities are represented by areas within a rectangle
- < probabilities are represented by areas within a "bell curve"
- < probabilities are proportional to the range of values being considered
- < outcomes toward the extremes are just as likely as outcomes toward the center

e. In Question #3, is the value 18 a *parameter* or a *statistic*? **Explain you answer!**

[4]

f. Explain why the mean 0 computed from an SRS is called an *unbiased estimator* for the mean of the entire population µ.

[5]