2/20/2002　　　　　MA331 Applied Prob/Stat I　　　　Name:_____
Dr. Lunsford　　　　　　　　　Test 1　　　　　　　　(100 Points Total)

Neatly show all work on this test. Clearly indicate your answers. Good luck!

I. An urn contains 6 red balls and 8 green balls. An experiment is performed in which four balls are drawn from the urn without replacement. Let X count the number of red balls in the draw. Please answer the following questions concerning this experiment. (21 points total).

a. Suppose we perform the experiment 20 times and get the following data for the value of X:

$$1, 3, 2, 2, 3, 3, 1, 1, 1, 0$$
$$2, 2, 1\ 2, 1, 3, 2, 2, 2, 2$$

Find and graph the relative frequency distribution for the sample data on the axes provided below. (6 points)
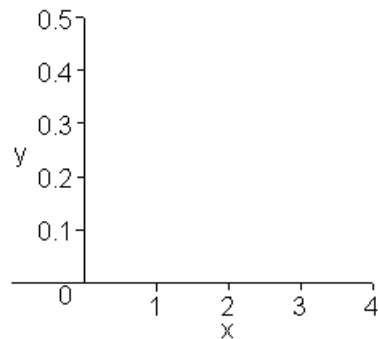
b. Find the sample mean of the data in part (a). You are welcome to use technology here however please show the formula you use to compute this value. (4 points)

c. Find the sample standard deviation of the sample data in part (a). You are welcome to use technology here however please show the formula you use to compute this value. (4 points)

d. Compute the interval $(\bar{x} - s, \bar{x} + s)$ and show it on the histogram above. (3 points)

e. What is the actual (not empirical!) probability that $X = 3$ (i.e. $P(X = 3)$)? (4 points)

II. Suppose P is a probability function on a sample space S and A and B are events in S such that $P(A) = 0.6$, $P(B) = 0.4$, and $P(A \cap B) = 0.24$. Please answer the following. (4 points each, 24 points total)

a. $P(A \cup B)$

b. $P(A|B)$

c. $P(A' \cap B)$

d. $P(A' \cup B')$

e. Find the probability that event A or event B but not both occur.

f. Are the events A and B independent events? Why or why not?

III. A fair coin is flipped eight times. Let the random variable X be the number of heads in the eight flips. Please answer the following (5 points each, 10 total)

(a) Find the probability of exactly five heads in the eight flips.

(b) What is the probability of getting exactly 5 heads in the eight flips given that at least one head was obtained in the eight flips?

IV. The following table classifies 1456 people by their gender and by whether or not they favor a gun law.

	Male (M)	Female (F)	Totals
Favor (A)	392	649	1041
Oppose (B)	241	174	415
Totals	633	823	1456

Suppose one of these persons is selected at random. Let F be the event the person is a female, M the event the person is a male, A the event the person favors the gun law and B the event the person opposes the gun law. Find the indicated probabilities below. For each probability, describe in words, using a complete English sentence, the probability that you have found. (4 each – 12 total)

(a) $P(M \cap A)$

(b) $P(F \mid B)$

(c) $P(B \mid F)$

V. In a certain population of voters 30% are Republicans, 50% are Democrats, and 20% are Independents. It is reported that that 20% of the Republicans, 80% of the Democrats, and 50% of the Independents favor a certain issue. Please answer the following. (11 points total)

(a) If a person chosen at random from this population favors the issue then what is the probability that the person is a Democrat? Clearly identify all events you use for this computation. (9 points)

(b) Compare the probability computed in part (a) to the probability that a randomly selected person from the population is a Democrat. Explain any numerical differences in these two probabilities. (2 points)

VI. An urn contains 6 red balls and 9 blue balls. Four balls are drawn one at a time from the urn and the color of each draw is recorded. An R is recorded when a red ball is drawn and a B is recorded when a blue ball is draw. Please answer the following: (16 points total)

(a) If the balls are drawn with replacement then what is the probability of the four draws being RRBR? (3 points)

(b) If the balls are drawn without replacement then what is the probability of the four draws being RRBR? (3 points)

(c) If the balls are drawn with replacement then what is the probability of drawing exactly three red balls in four draws? (4 points)

(d) If the balls are drawn without replacement then what is the probability of drawing exactly three red balls in four draws? (4 points)

(e) Which of the models (drawing with replacement and/or drawing without replacement) corresponds to the outcome of each draw being an independent event? Why? (2 points)

VII. Based on your reading of the book, "Statistics That Lie" and our discussions in class please answer the following. Attach your answers to the test paper. (6 points total)

1. We have learned about the average (or mean) and the variance (and hence the standard deviation) of a set of data. Explain what the mean and the standard deviation measure for a set of data, any sensitivity to the data these measures may have, and why one would like to know BOTH measures for a set of data. (4 points)
2. Suppose a fair coin produces nine heads in a row when flipped. Should you bet a large sum of money that the next flip will be a tail? Why or why not? (2 points)