

Final Examination
Math 305 - Chance
Tuesday, December 15, 1998

§1 Computation:

- 1) Draw a histogram for the following data, which gives the distribution of the time it takes a person to get to work in Baltimore County, from 1990 Census data. Assume that the maximum time needed to get to work is 120 minutes.

Less than 5 minutes	7016
5 to 9 minutes	27026
10 to 14 minutes	44706
15 to 19 minutes	52769
20 to 24 minutes	58783
25 to 29 minutes	31205
30 to 34 minutes	62032
35 to 39 minutes	12716
40 to 44 minutes	15022
45 to 59 minutes	25631
60 to 89 minutes	12634
90 or more minutes	2867

- 2) Find the mean and standard deviation of the list 41, 48, 50, 54, 57.

- 3) Find the correlation coefficient of the following set of numbers.

x:	1	1	1	1	2	2	2	3	3	4
y:	1	2	1	3	1	4	1	2	2	3

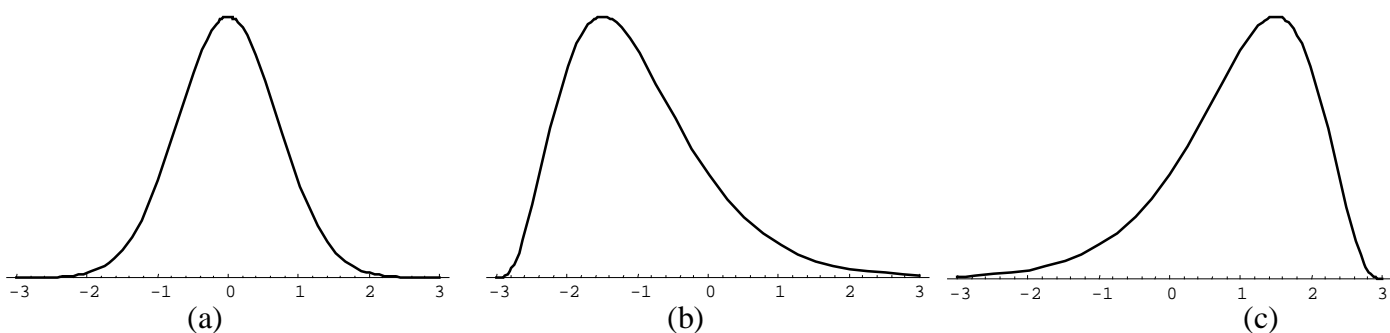
- 4) Three cards are dealt from a well shuffled deck.
- Find the chance that all of the cards are diamonds.
 - Find the chance that none of the cards are diamonds.
 - Find the chance that the cards are not all diamonds.
- 5) A coin is tossed 50 times. Use the normal curve to estimate the chances of getting between 20 and 30 heads.

§2 Comprehension:

- 6) California is evaluating a new program to rehabilitate prisoners before their release; the object is to reduce the recidivism rate- the percentage who will be back in prison within two years of release. The program involves several months of "boot camp"- military-style basic training with very strict discipline. Admission to the program is voluntary. According to a prison spokesman, "Those who complete boot camp are less likely to return to prison than other inmates."
- What is the treatment group in the prison spokesman's comparison? The control group?
 - Is the prison spokesman's comparison based on an observational study or a randomized controlled experiment?
 - True or false: the data show that boot camp worked.
- 7) A hypothetical company is hiring 70 people in each of three different departments- Marketing, Product Development, and Accountancy. If 60% of the men who apply to the company are hired, and

if 80% of the women who apply to the company are hired, can we conclude that gender plays a role in the hiring process in this company? Why or why not?

- 8) Below are histograms for three sets of data.
- What is the mean of each histogram? Choose from the following list: -1.6, -1.2, -0.6, 0, 0.6, 1.2, 1.6.
 - Match the histogram with the description
 - The median is less than the average.
 - The median is about equal to the average.
 - The median is greater than the average.
 - Is the SD of histogram (a) around 0, 1, 2, or 3?
 - True or false, and explain: The SD for histogram (a) is a lot smaller than the SD for histogram (b).



- 9) Among applicants to law school in 1993, the average LSAT score was about 169, the SD was about 9, and the highest score was 178. Based on this information, can we decide if the LSAT scores followed the normal curve or not? Explain.
- 10) What is the difference between bias and chance error? Explain and provide an example.
- 11) The correlation between height and weight for men age 18-74 is about 0.40. Say whether each conclusion follows from the data; explain your answer.
- Taller men tend to be heavier.
 - The correlation coefficient between weight and height for men age 18-74 is about 0.40.
 - Heavier men tend to be taller.
 - If someone eats more and puts on 10 pounds, he is likely to get somewhat taller.
- 12) In one study, the Educational Testing service needed a representative sample of college students. To draw the sample, they first divided up the population of all colleges and universities into relatively homogeneous groups. (One group consisted of all public universities with 25,000 or more students; another group consisted of all private four year colleges with 1,000 or fewer students; and so on.) They then chose one representative school from each group. That created a sample of schools. Each school in the sample was then asked to pick a sample of students. Was this a good way to get a representative sample of students? Answer yes or no, and explain.
- 13) What is the law of averages? Explain, with examples.
- 14) In *A Civil Action*, Schlichtmann makes use of the Zelen health study to prove his case. What did that study show? What possible sources of error did it contain?
- 15) Why are there no .400 hitters anymore? Explain.

§3 Applications:

- 16) You are thinking about playing the lottery. The rules: you buy a ticket, and choose three different numbers from 1 to 100, and have them printed on the ticket. The lottery has a box with 100 balls numbered from 1 to 100. Three balls are chosen at random without replacement. If the numbers chosen match the numbers on your ticket, you win; order does not matter. If you decide to play, what is your chance of winning?
- 17) With a Nevada roulette wheel, there are 18 chances in 38 that the ball will land in a red pocket. A wheel is going to be spun many times. Which of the following two choices is better; explain your answer.
- a) The wheel is spun 38 times, and you win a dollar if the ball lands in a red pocket 20 or more times.
 - b) The wheel is spun 76 times, and you win a dollar if the ball lands in a red pocket 40 or more times. What happens if we replace (b) with
 - c) The wheel is spun 76 times, and you win a dollar if the ball lands in a red pocket 38 or more times.
- 18) A gambler plays roulette 1,000 times. There are two choices
- a) Betting \$1 on a column every time.
 - b) Betting \$1 on a number every time.
- A column pays 2 to 1, and there are 12 chances in 38 to win; a number pays 35 to 1, and there is a 1 in 38 chance to win. True or false:
- i) The chance of winning is the same with (a) and (b).
 - ii) The chance of winning \$100 is bigger with (b).
 - iii) The chance of losing \$100 is bigger with (b).
- 19) According to the Census, a certain town has a population of 100,000 people age 18 and over. Of them, 60% are married, 10% have incomes over \$75,000 a year, and 20% have college degrees. As part of a pre-election survey, a simple random sample of 1,600 people will be drawn from this population.
- a) What is the chance that 58% or less of the people in the sample are married?
 - b) What is the chance that 11% or more of the people in the sample have incomes over \$75,000 a year?
 - c) What is the chance that between 19% and 21% of the people in the sample have college degrees.
- 20) An organization surveys a town of 25,000 households. In their sample of 500 households, they find that 121 did not have a car, 172 had one car, and 207 had two or more cars. Estimate the percentage of households in the town with at least one car, and give a 95% confidence interval.