

Review Materials for Exam 2 (2/21/03)

Exam coverage: Chapter 16.1 and 16.4, Chapter 17, Chapter 18, Chapter 20.1-20.3, and Chapter 21.1-21.3

PLEASE BRING SOME FORM OF PHOTO IDENTIFICATION (e.g. Bruin Card, Drivers License, etc.) TO THE EXAM. ATTENDANCE WILL BE TAKEN. PLEASE REMEMBER TO BRING WRITING INSTRUMENTS AND A CALCULATOR. WE WILL PROVIDE AN EXAM PACKET AND TABLE A-105 FROM THE TEXT.

A ONE SIDED 8.5" x 11" piece of paper with formulas is allowed into the exam. Typed, laser print, cut and paste, handwritten is OK

Suggested Extra Problems From Your Textbook:**Chapter 16**

Exercise Set A: #6, #7

Review Exercises: #1, #4, #6, #10

Chapter 17

Exercise Set A: #1, #3

Exercise Set B: #1, #4, #6

Exercise Set C: #3, #4

Exercise Set D: #4

Exercise Set E: #3

Review Exercises: #1, #3

Chapter 18

No suggested problems, please review the summary on page 329-330

Chapter 20

Exercise Set A: #1, #2,

Review Exercises: #3a-f, #7, #9

Chapter 21

Review #7

PLEASE NOTE: THE EXAM IS NOT THIS LONG, THIS IS A COLLECTION OF SEVERAL EXAMS. TYPICALLY THE SECOND EXAM HAS 4 PROBLEMS WITH MULTIPLE PARTS

There are 20,000 restaurants in the County of Los Angeles, 50% of them received a letter grade of "A" during inspections, 40% received either a B or a C grade and 10% failed their inspections. Restaurant grades are not normally distributed. My financial adviser, the Oracle, has hired you as a temporary personal assistant. Your job is to schedule his next 100 dinners (Oracle never eats at home). Unfortunately, you didn't know about the rating system and you never eat out because you don't have the money. So you listened to your best friend and picked 100 restaurants at random from an internet database of the 20,000 restaurants in Los Angeles. The Oracle will give you +3 points if you choose "A" restaurants, +1.25 points if you choose "B" or "C" restaurants, and -20 points if you choose a restaurant with a failing grade. Treat your restaurant selections as if they were a simple random sample of restaurants.

1. Construct a box model for this problem
2. What is the expected value for the total score of the 100 restaurants selected at random?
3. What is the standard deviation for the box?
4. What is the standard error for the total score of a sample of 100 restaurants?

5. To convert your temporary job into a permanent job, you must have accumulated a total of at least +5 points from the Oracle after picking 100 restaurants for him. What's your chance of getting a total of at least +5 points after picking 100 restaurants? If it is not possible to calculate the chance, please write "not possible" below and explain why.

6. Suppose we are psychics and we know that former police chief Bernard Parks will be the next Mayor of Los Angeles with a final winning percentage of 55%. Unfortunately, we don't know Parks and he doesn't return our phone calls or e-mails so he doesn't know he will get 55% of the vote after the next election. In fact, he is spending a lot of money right now on random surveys of votes of size 81 to help him make decisions about the upcoming election.

- a. What is the chance that one of his surveys will give a result showing that he will get 49% or less of the vote if it is true that he really has 55%?

- b. Suppose again that Parks does not know that he will get 55% of the vote and suppose he takes another random survey of size 81 and it shows that 49% will vote for him. Can you construct a confidence interval for the population percentage of votes for Parks?

Circle one: Yes No

If you circled yes, please construct a confidence interval. If you circled no, please explain why you cannot construct a confidence interval.

7. There were a total of 226,324 deaths in California in 1999. A random sample of 242 deaths was selected. Detailed research determined that the deceased was cremated in 99 of the deaths.

- a. Determine a 99% confidence interval for the proportion (or percentage) of deaths in California in which the deceased is cremated.
- b. Suppose the confidence interval is too narrow, identify 2 things you can do to make the interval wider.
- c. A classmate comes up to you and says, this is the interpretation of a 99% confidence interval:
"There is a 99% probability that the true parameter is in the interval you gave in part (a)"
Is your classmate's interpretation correct? (circle one) YES NO
And justify your choice in the space below.

8. You know that every UCLA student will definitely get a job after graduation. The only uncertainty is the salary. Suppose this is what you know about the job prospects of UCLA students after graduation:

There is a 35% chance that the salary will be \$20,000 per year; a 45% chance that it will be \$90,000 per year; and a 20% chance that it will be \$40,000 per year. Suppose you draw a random sample of 121 UCLA students.

- a. Draw a reasonable box model for this problem
- b. Find the expected value of the total (sum) salary for the 121 UCLA students.
- c. What is the Standard Deviation of the "box" you drew?
- d. What is the Standard Error of the total (sum) salary for 121 students?
- e. Suppose you work for me and I tell you to go draw a different random sample of 121 UCLA students and you get a total (sum) salary of \$7,000,000. What is the chance that you could have gotten a total salary this large or larger?

9. Exercise is particularly beneficial for young adults. A study wants to examine the exercise habits of college students. A sample of 36 college students is selected by a random process. For the next 5 questions please assume that the sample is large enough and it is found that a 68% confidence interval for the percentage who exercise weekly is 22.4% to 37.6%. Using this information, please answer the following true/false questions (4 points each)

	True	False	Statement
A			There is a 68% chance that for all college students, percentage who exercise weekly is between 22.4% and 37.6%
B			If we quadrupled the sample size, we would expect the 68% confidence interval to be one half as wide.
C			If we increased the confidence level to 99%, we would expect the confidence interval get wider.
D			This 68% confidence interval is valid only when the population variable (percentage who exercise) is normally distributed.
E			The sample statistic that generated this confidence interval is 30%, in other words 30% of the sample was found to exercise weekly.

10. Suppose it is known that 30% of all college students exercise weekly. A physiology class needs enough students for a medically valid study and a sample of size 36 is not large enough. So if 1600 college students are chosen at random instead of 36, what is the chance that between 432 and 464 of those chosen do indeed exercise weekly? (8 points)

a. Please compute a 95% confidence interval for the percentage of all U.S. infants who sleep at least 12 hours per night.

- b. Suppose the sample size was increased to 400 infants, what effect would this have on the confidence interval? Assume that 54% of them slept at least 12 hours per night.
- c. Please calculate a 90% confidence interval for the percentage of all U.S. Infants who sleep at least 12 hours per night. Again, please use the original sample of size 100 and assume the percentage in the sample was 54% sleep at least 12 hours per night.

12. It's a family tradition: your professor goes to Las Vegas every year for Thanksgiving. A new casino has opened and they are playing a modified roulette game that has 40 possible numbers that can be spun on a wheel. To play you bet \$4 and you get to choose 4 numbers. If the wheel lands on any number that you chose, you win \$10. If the wheel does not land on a number you choose but on one of 8 "special numbers" you don't win or lose anything. If the wheel lands on any of the remaining numbers (not the ones you choose or the special numbers), you lose your bet of \$4. Suppose the typical person plays 25 times. Assume 25 plays is enough.

a. This game of modified roulette can be represented by a box model, please construct a reasonable one in the space below.

b. The 25 plays can be treated like a random sample of size 25. Find the expected value of this game.

c. Find the standard error of this same game.

d. Suppose the professor decides to spend \$100 playing a total of 25 times and she lost \$5. Calculate the chance that your professor could lose 5 or fewer dollars playing this game. Show all of your work and answer this question – based on your calculations is she lucky? (let's suppose lucky means the chance of losing 5 or fewer dollars is less than 5%)?

13. A survey of Los Angeles is conducted and 3,000 households are drawn at random. Suppose 30% of all households in Los Angeles have only one person living there. What is the chance that the number of households with only one person will be in the range 740 to 850?

14. From their extensive records, the IRS knows that 20% of federal income tax returns have an arithmetic error serious enough to warrant an audit. If 100 tax returns are randomly selected, what is the probability that at least 15 of them have arithmetic errors?

15. In 2001, a survey organization takes a simple random sample of 1,600 adults in Los Angeles, California, a large American city. Among this sample of adults, it was found that 975 support the death penalty, 525 support life imprisonment with no parole and the rest did not believe in penalties for homicide. It was noted that support for the death penalty had changed from a survey taken in 1991 when approximately 80% of adults in Los Angeles supported the death penalty.

a. Is it possible to construct a 95% confidence interval for the population percentage of Los Angeles adults who support the death penalty in 2001. (circle one)

YES

NO

If you circled YES, please construct a 95% confidence interval in the space below. If you circled NO, please use the space to explain why it is not possible to construct a 95% confidence interval.

b. If the sample size were 400 instead of 1600 it would (circle one to fill in the blank) the width of any confidence interval constructed from the sample information

Increase

Decrease

Not Affect

- c. If the level of confidence were 99% instead of 95% it would (circle one to fill in the blank) the width of any confidence interval from the sample information

Increase

Decrease

Not Affect

- d. Suppose it was known that actually 60% of all adults in Los Angeles support the death penalty. So if a simple random sample of 625 adults were to be taken, the SE for the sample percentage of death penalty supporters is calculated to be about 2%. You should assume these numbers are correct.

A student, looking at the numbers in part d, interprets them as follows: this means that there is about a 95% chance for the percentage of death penalty supporters in the sample to be in the range $60\% \pm 4\%$. (circle one)

The student is correct

The student is not correct

Please explain your choice below:

16. The most recent census of Los Angeles, California revealed that 63% of the residents in the city identified their race/ethnic background as "Hispanic", 15% identified their race/ethnic background as "Non-Hispanic White", 12% as "Asian", 8% as "Black" or "African American and 2% as "Other". Next month, a research group at the UCLA Medical School plans to take a simple random sample of 300 residents in Los Angeles

- a. Can you calculate the standard error for the total number of residents in the sample identifying themselves as "Non-Hispanic White"? If it is possible please write "possible" below and justify your response. If it is not possible, please write "not possible below" and justify your response.
- b. What is the chance that between 59% and 64% of residents the UCLA Medical School sample will identify themselves as "Hispanic"?

- c. If the UCLA Medical School increases the sample size to 900, the expected percentage of residents in the sample identifying themselves as “Other” is expected to:
 - i. Increase
 - ii. Decrease
 - iii. Stay the same
 - iv. Double
 - v. Triple
- d. What is the chance that in a sample of 300 residents, 27 or more will identify themselves as “Black” or “African American”? If this is calculable, please show how to calculate the chance below, if it is not, please write “not calculable” and justify your response

23. In a certain precinct, 80% of the voters are Republican. A simple random sample of size 400 is drawn with replacement. Each person in the sample is polled and the percentage of Republicans in the sample is calculated.

- a) What is the expected value for the percentage of Republicans in the sample?
- b) What is the standard error for the percentage of Republicans?
- c) What is the chance that this percentage is between 78% and 88%?

24. In a simple random sample of 400 Los Angeles residents taken by a polling organization, only 30% expressed support for the mayor. Find a 90% confidence level for the corresponding percentage in the whole population of Los Angeles
25. You pay \$1 to roll a pair of dice. If you roll a sum of 7 you receive \$5. For all other rolls you receive nothing. Suppose the chance of rolling a sum of 7 is $1/6$. You plan to roll the die 16 times as a game.
- a) The expected value of this game is approximately:
 - b) The standard error of this game is approximately:
 - c) The chance that you will win at least one dollar playing this game is approximately:

26. The most recent enrollment statistics for the Los Angeles Unified School District revealed that 71% were identified as “Hispanic”, 10% as “Non-Hispanic White”, 12% as “Black” or “African American and the remainder as “All Others”. A recent survey of excellent quality conducted by UCLA on 225 students in the Los Angeles Unified School Districted revealed that 6% were “Asian”

A. What is the chance that between 5% and 8% of students in a sample of 225 will be identified as “All Others”?

B. If the sample size were 400 instead of 225 it would (circle one to fill in the blank) the standard error for the sample count of “All Others” students

Increase

Decrease

Not be enough information to calculate

C. Can you construct a 90% confidence interval for the percentage of “Asian” students in the Los Angeles Unified School District using information from the original sample of 225? (circle one)

YES

NO

If yes, please construct it in the space below, if no, please explain why this is not possible.

(continuing part c) Suppose it is possible to calculate a confidence interval. If the level of confidence were changed to 80% instead of 90% it would (circle one to fill in the blank) the width of any confidence interval from the sample information

Increase

Decrease

Not Affect

D. What percentage of samples of size 225 will have fewer than 23 “Black or African American” students?

27. Some friends take you to a casino and you are confronted with two games.

GAME A works like this: you can bet \$8 on a number, and if your number comes up, you win \$11, if not, you lose your \$8. Your number comes up 35% of the time.

GAME B works like this: you can bet \$3 on a number, and if your number comes up, you win \$2, if not, you lose your \$3. Your number comes up 55% of the time.

A. Please construct box models for each game in the space below. Please label them clearly so we know which represents GAME A and which represents GAME B.

B. Please calculate the box average and box standard deviation for each game. Again please label them clearly so we know which is which.

C. Your friends want to stay and play 49 times, assume this is a reasonably large number of times. Which game offers you a better chance of winning money? Please show your work for full credit.

The game with the better chance is: (circle one)

GAME A

GAME B

Please indicate whether each statement is true or false

	True	False	Statement
28A			The probability histogram for samples follows the normal curve more closely as the sample size increases
28B			The more the histogram of a population differs from normal, the larger the sample is needed before the probability histogram appears normal
28C			The variability of a probability histogram is the standard deviation of the population
28D			The Central Limit Theorem requires that sampling be done with replacement for the probability histogram to follow the normal curve
28E			The Central Limit Theorem applies to products and percentages, but not to sums

29. The Dull Computer Company manufactures its own computers and delivers them directly to customers who order them via the Internet. Dull's market dominance has arisen from its quick delivery and competitive pricing. The CEO (Chief Executive Officer) of Dull has stated publicly that if customers make unassisted online purchases of their computers, the computers will have an average delivery time of 57 hours from the time of purchase (with a standard deviation of 11 hours). He also noted that they will have an average cost of \$1,500 with a standard deviation of \$400 and 15% of their computers cost less than \$1100. Please assume that the cost of the computers are normally distributed

A consumer research organization decided to test the CEO's delivery time claim by purchasing 100 computers from Dull at randomly selected times and days. The 100 purchases were randomly divided into two groups: 51 were purchased by telephone and involved talking to a live salesperson, the remaining 49 were unassisted online purchases. 11 of the 49 computers were delivered in less than 45 hours. Please assume that the purchases (i.e. 100, 51, 49) constitute reasonably large samples.

A. Please construct a 80% confidence interval for the population percentage of computers that will be delivered in less than 45 hours.

B. What is the probability that a sample of size 49 will have between 16% and 20% of its computers costing less than \$1100?