Review Materials for Test 2 (5/17/04)

Prof. Lew Extra Office Hours: Thursday 5/13/04 11:30am-12:30pm, Friday 5/14/04 10am-10:50am. Saturday 5/15/04 from 10am-noon. E-mail will be accepted and guaranteed answered (as long as I receive it) if you send it before 11:59pm on 5/15/04.

Exam coverage: Chapter 3.1-3.5, Chapter 4.1-4.6

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 IV (standard normal table with Z scores) FROM THE INSIDE FRONT COVER OF THE TEXT.

A ONE SIDED 8.5" x 11" piece of paper with formulas or anything else is allowed into the exam. Typed, laser print, cut and paste, handwritten, ink/pencil/crayon, small fonts, fancy fonts, solved problems, prayers, curses, are OK. I do not collect or examine these.

Make sure you review the lecture notes before the exam.

WHAT FOLLOWS ARE ACTUAL EXAM QUESTIONS USED IN PAST CLASSES. YOUR TEST WILL NOT BE THIS LONG. IN GENERAL EXAMS CONSIST OF 3 PERHAPS 4 QUESTIONS WITH MULTIPLE PARTS.

1. The Dull Computer Company makes 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 of Dull has stated publicly that if customers make unassisted online purchases of their computers, they will have a mean delivery time of 48 hours from time of purchase with a standard deviation of 11 hours and a mean cost of $2,403 with a standard deviation of $800. The quickest delivery time was 12 hours and the slowest delivery time was 102 hours. Assume that both delivery time and cost are normally distributed continuous random variables.

a. What percentage of unassisted online computer purchases is expected to have a delivery time between 31 and 34 hours?

b. What is the probability that a computer purchased unassisted and online will cost between $2500 and $3000?

c. Suppose there is a transportation strike and delivery times are doubled plus an extra hour for carrier changes for all computer purchases, so for example, a computer which once took 39 hours for delivery will now require (39*2) + 1 = 79 hours for delivery. How long will you need to wait for the slowest 2% of deliveries to be completed?

d. What percentage of unassisted online computer purchases is expected to cost more than $1,450?

e. What is the probability that two computers purchased unassisted and online and also selected at random, will each take longer than 60 hours to be delivered?

2. We recently downloaded the current market information on publicly traded securities from www.yahoo.com. There are 495 active S&P 500 stocks in the dataset. The next questions refer to the following Stata output:

```
    Variable   |       Obs        Mean    Std. Dev.       Min        Max
---------------+--------------------------------------------------------
returnonequity |       495    16.94004    48.82139   -135.842    698.619
returnonassets |       495    4.564465    8.211995    -46.844     50.347
```

Please assume that both variables are normally distributed

a. What are the medians for these variables?

b. What is the "return on equity" of a security at the 10^{th} percentile of the distribution? What is the "return on equity" of a security at the 75^{th} percentile?

c. Suppose "return on equity" and "return on assets" are independent and unrelated. What is the probability of selecting a security that is one standard deviation above the average on both variables?

d. What is the probability that a security, selected at random, will have a "return on assets" between –1% and 3%?

e. A security has a "return on assets" of 16%, assuming that it's "return on equity" has the same relative position in the distribution, what is this security's estimated "return on equity"?

3. Congratulations, you graduated from UCLA and own your own company. Your Chief Information Officer (CIO) has developed a probability distribution of the number of computer failures per day at your firm by type of computer (Windows machines and Macs). To make your life difficult, she left out some information:

a. You need to complete the distributions: (4 points)

Windows Machines

outcome (failures)	0	1	2	3
probability		.08	.03	.48

Macintosh Machines

outcomes (failure)	0	1	2	3
probability	.04		.26	.06

b. Please calculate the mean failures for each type of machine.

c. Please calculate the standard deviation for the failures for each type of machine.

d. Suppose that each time a Windows machine fails it costs $100 for its repair plus a service call charge of $75 just to get the repairman on site. And suppose each time a Macintosh fails, it costs $250 for repair plus a service call charge of $100 just to get a repairman on site. What is the expected value repair cost of her Windows machines this week? What is the expected value of the repair cost of her Macintoshes this week?

e. Productivity is a function of computer availability. Thus, computers made unavailable as a result of failure affect productivity according to the following function:

productivity = $2000 - 350(X) - 10(X^2)$

where X=number of computers that fail. Please compute the expected productivity for the firm if they decide to only use Windows computers.

4. You work for a credit card issuer and it is your job to issue cards to new customers. Since you also go to school, you decide to randomly issue cards to college students. Suppose it is known that 30% of all college students will eventually fail to pay their credit card debt within the first year of possessing a credit card.

A. You issue credit cards to 15 students selected at random, what is the chance that exactly 8 of them will fail to pay their credit card debt within the first year? Assume independence.

B. Suppose this table describes the population of college students:

	Had One Credit Card	Had More than One Credit Card	Total
Failed to Pay in the 1st year	.10	.20	.30
Did Not Fail to Pay in 1st Year	.50	.20	.70
Total	.60	.40	1.00

Given that a student had more than one credit card, what is the probability that the student failed to pay in the first year?

Given that a student failed to pay in the first year, what is the probability that they had one credit card?

Are these two variables independent? Answer yes or no and then show your justification mathematically.

Are these two variables mutually exclusive? Answer yes or no and then show your justification mathematically.

What is the probability that a student, selected at random, had more than one credit card and failed to pay in the 1st year?

5. Congratulations! You became a traveling salesperson for a large manufacturer. You make 3 calls per year on each client. Your chance of a sale each time is 75%. The next two questions ask you about what can happen after one year.

a. Please construct a valid probability distribution from the information given above.

b. Using the information in your probability distribution (it's OK if the values are wrong, pretend that they are correct) what is the mean number of sales and what is the variance?

c. Suppose your net earnings is a function of your sales, specifically:

Net Earnings= $\$1000X - \$50X^2$

Where $- \$50X^2$ is a downward adjustment in your physical well-being for all of the miles you travel. What is the expected value of your net earnings E(Net Earnings) and what is the variance VAR(Net Earnings)?

6. The CEO of company A bids on consulting jobs so that if awarded the job, company A will make a $200,000 profit on that job. The CEO of company B bids on consulting jobs so that if awarded the job, company B will make a $600,000 profit. Each company has a probability distribution of the number of jobs the company is awarded per year…unfortunately, there is a little bit of missing information:

a. Fill in the missing information (2 points each company, 4 points total)

Company A

Number of jobs	0	1	2	3	4
Probability	.01		.53	.32	.00

Company B

Number of jobs	0	1	2	3	4
Probability	.00	.37		.22	.04

b. What is the mean profit for each company?

c. Find the standard deviation of the number of consulting jobs awarded per year for each company.

d. What is the standard deviation of the profit?

7. A quality initiative is a program of responsive customer service activated by continuously monitored and improved work procedures for company employees. In the course of evaluating the effectiveness of a new quality initiative, a company surveyed all the company's employees to indicate how strongly they agreed or disagreed with a series of statements about the new quality initiative. This is a distribution of counts of their responses:

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
60	128	82	18	12

Suppose we assign the values 1 to "Strongly Agree", 2 to "Agree", 3 to "Neither Agree nor Disagree", 4 to "Disagree" and 5 to "Strongly Disagree". Please use the information that you have been given to fill out the outcomes and probabilities in the table below and then answer the following questions:

a.

outcome					
probability					

b. What is the probability that a randomly selected employee will agree or strongly agree with the new quality initiative?

c. What is the probability that three randomly selected employees will agree or strongly agree with the new quality initiative?

d. What is the mean agreement score and what is the standard deviation of that score?

e. Five employees are chosen at random with replacement from the population of employees. What is the chance that exactly 3 of them will "Neither agree nor disagree"?

8. Al and Larry are mutual fund managers. Al's fund FDCHR has a one-year return of -9% (a loss). John's fund TRSEC has a one-year return of 2% (a gain). The 6,000 mutual funds reported by the Wall Street Journal are normally distributed with a mean one-year return of -3% and a standard deviation of 8%

a. What percentage of mutual funds had returns between Al's & John's funds? (3 points)

b. What are the returns for funds at the 25^{th} percentile and at the 75^{th} percentile? (3 points)

c. My financial adviser believes inflation should be taken into account when measuring fund performance. Suppose he adjusts all of the fund returns by subtracting 2% and then multiplying by 4. For example, Al's fund would now return -44% (a loss). I need a return of 4% or more for a fund to qualify as investment quality. What percentage of all funds will qualify?

d. A fund is 1.5 standard deviations below average, what is its one-year return?

e. What is the chance that if you could select 5 funds at random with replacement, all 5 would have non-negative returns (greater than or equal to 0) returns?

9. Jack and Jill, brother and sister, both take the GMAT with the hopes of going to business school one day. Jack scored a 590 and Jill scored a 490. Assume that the GMAT is normally distributed with a mean of 500 and a standard deviation of 100 for all people taking the exam.

a. What percentage of test takers did better than Jill but not as well as Jack?

b. Stanford University Business School will only admit students with GMAT scores in the top 3% of all GMAT scores. Using the information above, what is the minimum acceptable GMAT score?

10. The starting pay as a full service stockbroker $10 per hour with an additional standard commission of approximately $52 per one hundred shares sold. Here is the probability distribution of sales in multiples of one hundred shares during the normal trading day of 7 hours duration:

Sales (in hundreds)	25	50	75	100
p(x)	.05	.65	.28	.02

if a= constant (fixed salary of $10 per hour) and b=commission and X=sales – a discrete random variable, please compute the following:

a) The expected value of the stockbroker's daily pay.

b) The standard deviation of the stockbroker's daily pay.

c) Suppose the investment bank is changing the pay formula to the following for stockbrokers who have been employed for more than one year:

$50(X) + 20(X^2)$

where X is still the number of "one hundred shares" sold and the probability distribution p(x) above still holds true. Note that there is no longer a "fixed" component to the pay.

Please calculate the new expected value and the new standard deviation.

11. Here is some very recent data on military deaths in Iraq.

Key
row percentage
column percentage

	Hostile Death		
white	not hostile	hostile	Total
not white	20.90	79.10	100.00
	41.18	55.89	52.01
white	32.35	67.65	100.00
	58.82	44.11	47.99
Total	26.39	73.61	100.00
	100.00	100.00	100.00

Let A= white and B=hostile. So P(A) would be interpreted as the probability that a selected death involved a person of the white race and P(B) would be interpreted as the probability that a selected death involved a hostile action (as opposed to accidental or illness-related). P(A′) would be interpreted as the probability that the selected death involve a non-white person. Using the table above only, please answer the following questions.

a. Find $P(A'|B)$

b. Find $P(A \cap B)$

c. Are A & B independent? Please show your mathematical justification for full credit.

d. Are A & B mutually exclusive? Please show your mathematical justification for full credit.

e. Find $(B|A')$

12. 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 the probability distribution 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 expected value and the 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. 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