

STATISTICS FOR MANAGEMENT (IDS 570)

HOMEWORK 3

DUE DATE: THURSDAY, SEPTEMBER 25 AT 11: 59 PM

Problem 1. (Sample Spaces). A car manufacturer is concerned with three defects which may occur during assembly. Each defect occurs with probability $\frac{1}{2}$, independently of the other two defects. If a car has all three defects it cannot pass inspection and hence cannot be sold.

- (a) What is the sample space for this situation?
- (b) What is the probability that a car cannot be sold due to the three defects?
- (c) A car with two defects passes inspection but can only be sold at a lower price. What is the probability that a car can be sold, but at the reduced price?

Problem 2. (Sample Spaces and Set Theory). The probability that it rains today is 0.3 and the probability that it rains tomorrow is 0.2. In addition, the probability that it doesn't rain BOTH today and tomorrow is 0.6.

- (a) What is an appropriate sample space to analyze this problem?
- (b) What is the probability that it doesn't rain on the first day?
- (c) What is the probability that it rains on at least one of the days?
- (d) What is the probability that it rains on BOTH days?
- (e) Are the events that it rains on the first day and it rains on the second day independent?

Problem 3. (Counting I). In a class of 100 students, 60 are male and 40 are female. The professor selects two different students to give two different presentations, one on Bayes' Theorem, and one on Tree Diagrams. First a student is randomly selected to give the presentation on Bayes' Theorem, and then from the remaining students another is randomly selected to give the presentation on Tree Diagrams.

- (a) What is the probability that the student selected to give the presentation on Bayes' Theorem is female (the other selected student can male or female)?
- (b) What is the probability that both presentations will be given by male students?
- (c) What is the probability that the presentations will be given by students of different gender?
- (d) Now suppose that the same student can be chosen for both presentations. In this case, what is the probability that both presentation are given by male students?

Problem 4. (Counting II). The owner of a small construction company realizes that some building materials are missing from inventory. The company has 9 workers, 3 of which are stealing material for personal use and 6 of which are not stealing material. The owner of the company decides to randomly select 3 of the workers to be investigated.

- (a) What is the probability that the owner selects all three employees who are stealing?
- (b) What is the probability that the owner selects only employees who are not stealing?

Problem 5. (Counting III). If a TV station airs a controversial show, it receive 0, 1, or 2 complaints all with equal probability. Suppose that a station airs 3 controversial shows.

- (a) What is the probability that the total number of complaints is 3?
- (b) What is the probability that the TV station receives the same number of complaints from each of the three shows?

- (c) What is the probability that the TV stations receives the same number of complaints from at least two of the three shows?

Problem 6. (Counting IV)

- (a) Luis starts counting at 45, and he counts by three. If 45 is the first number that Luis counts, what is the 15th number that he counts?
- (b) How many unique ways are there to arrange the letters in the word “TIGER”?
- (c) Luis is packing his bags for his vacation. He has 9 unique tigers. But only 5 fit in his bag. How many different groups of 5 tigers can he take?
- (d) How many unique ways are there to arrange the letters in the word “PRETTY”?

Problem 7. The following two-way table shows household income by educational level of the head of household.

Educational Level	Household Income (\$1000s)					Total
	Under 25	25.0-49.9	50.0-74.9	75.0-99.9	100 or more	
Not H.S. graduate	4207	3459	1389	539	367	9961
H.S. graduate	4917	6850	5027	2637	2668	22099
Some college	2807	5258	4678	3250	4074	20067
Bachelor's degree	885	2094	2848	2581	5379	13787
Beyond bach. deg.	290	829	1274	1241	4188	7822
Total	13106	18490	15216	10248	16676	73736

- (a) Compute the row percentages and identify the percent frequency distributions of income for households in which the head is a high school graduate and in which the head holds a bachelor's degree.
- (b) What percentage of households by high school graduates earn \$75,000 or more? What percentage of households headed by bachelor's degree recipients earn \$75,000 or more?
- (c) Construct percent frequency histograms of income for households headed by persons with a high school degree and for those headed by persons with a bachelor's degree. Is any relationship evident between household income and educational level?
- (d) Compute column percentages and identify the percent frequency distribution displayed. What percentage of the heads of households did not graduate from high school?
- (e) What percentage of the households earning \$100,000 or more were headed by a person having schooling beyond a bachelor's degree? What percentage of the households headed by a person with schooling beyond a bachelor's degree earned over \$100,000? Why are these two percentages different?