STAT 110 B, Probability & Statistics for Engineers II
UCLA Statistics, Spring 2003

http://www.stat.ucla.edu/~dinov/courses_students.html

HOMEWORK 2

Due Date: Friday, Apr. 25, 2003, turn in after lecture

Correct solutions to any five problems carry full credit. See the HW submission rules. On the front page include the following header.

- (**HW_2_1**) Some parts of California are particularly earthquake-prone. Suppose that in one such area, 30% of all homeowners are insured against earthquake damage. Four homeowners are to be selected at random; let X denote the number among the four who have earthquake insurance.
  (a) Find the probability distribution of X [Hint: Let S denote a home-owner who has insurance and F one who does not. Then one possible outcome is SFSS, with probability (0.3)(0.7)(0.3)(0.3) and associated X value 3. There are 15 other outcomes.]
  (b) Draw the corresponding probability histogram.
  (c) What is the most likely value for X?
  (d) What is the probability that at least two of the four selected have earthquake insurance?

- (**HW_2_2**) The cumulative distribution function of a discrete r.v. Y is as follows: (i.e. $F(y) = \Pr\{ Y \le y \}$)

$$F(y) = \begin{cases} 0.0, & \text{if } y<-1 \\ 0.2, & \text{if } -1\le y<0 \\ 0.5, & \text{if } 0\le y<1 \\ 0.8, & \text{if } 1\le y<3 \\ 1.0, & \text{if } 3\le y \end{cases}$$

  (a) Draw the graph of F(y).
  (b) Compute the pdf (probability density function) of Y .
  (c) Compute $\Pr\{ 0 \le Y \le 2 \}$.
  (d) What are the mean and variance of Y?
  (e) Let $Z = e^{\sin(\pi Y/2)}$. What is the pdf of Z? What's the ***coefficient of variation*** (μ_Z/σ_Z) for

the pdf of Z?

- (**HW_2_3**) Phone messages come to your desk at the rate of 2 per hour. Find the probability that if you take a 15-minute break you will miss
(a) no calls.
(b) no more than 1 call.

- (**HW_2_4**) Let X denote the lag time in printing queue at a particular computer center. That is, X denotes the difference between the time that a program is placed in the queue and the time at which printing begins. Assume that X is normally distributed with mean μ=15 minutes and variance σ^2=25.
(a) Find the expression for the density for X.
(b) Find the probability that a program will reach the printer within 3 minutes of arriving in the queue.
(c) Would it be unusual for a program to stay in the queue between 10 and 20 minutes? Explain, based on the approximate probability of this occurring. You do not have to use the Z table to answer this question!
(d) Would you be surprised if it took longer than 30 minutes for the program to reach the printer? Explain, based on the probability of this occurring.

- (**HW_2_5**) Overbooking occurs when the number of tickets sold by an airline exceeds the seating capacity of the aircraft. This is done to protect the airline from no-shows. This practice is, unfortunately, not limited to airline reservations. Assume that the UCLA College of Arts and Sciences can admit at most 820 freshmen in Fall 2004. Assume also that is sends out 1600 acceptances and that each student comes to the college with probability 0.5.
(a) What is the probability that the school ends up with more students than it can accommodate? [Hint can use Normal approximation to Binomial!]
(b) Find the largest number ***n*** that the college could accept if it wants the probability of getting more students than it can accommodate to be less than 0.05.

- (**HW_2_6**) Suppose X and Y are random variables with E(X) = 4; E(Y) = -1; $E(X^2) = 41$; $E(Y^2) = 10$; E(XY) = 6. Using only this information:
(a) Compute Var(X + Y).
(b) Compute the correlation coefficient between X and Y.
(c) Are X and Y independent? Explain.

Last modified on Mon, 14 Apr 2003 04:56:54 GMT by dinov@stat.ucla.edu.

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