

Homework Assignment 2
(Due Monday, February 8, 2010)

1. Suppose a new drug (B) improves upon an older one (A) by increasing the probability of self-reported relief from gastric distress from 40% to 65%. Suppose drug A is given to 10 randomly-sampled patients and drug B is given to a second 10. Let Y_A and Y_B be the number out of 10 patients that will experience relief in each group.
 - (a) What is the set of possible outcomes for Y_A ?
 - (b) Plot the probability distributions for Y_A and Y_B .

 2. Suppose that 1/100,000 bacterial cells contain a mutation providing resistance to substance A. Suppose I create a bunch of plates with 200,000 cells per plate. Let X be the number of cells on a plate that are resistant to substance A. Then X should follow a Poisson($\lambda=2$) distribution.
 - (a) What is the mean number of cells in a plate that are resistant to A?
 - (b) What is $SD(X)$?
 - (c) Calculate $\Pr(X = 0)$.
 - (d) Calculate $\Pr(X = 5)$.
 - (e) Calculate $\Pr(X > 2)$.

 3. A study of 400 glaucoma patients yields a sample mean of 140 mm and a sample standard deviation of 25 mm for the following summaries for the systolic blood pressure readings. Construct the 95% and 99% confidence intervals for μ , the population average systolic blood pressure for glaucoma patients.

Remember that for a normal distribution 95% of the area under the curve is between ± 1.96 standard deviations, and 99% of the area under the curve is between ± 2.58 standard deviations from the mean.
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OPTIONAL

4. The Army Medical Corps is concerned about the intestinal disease X. From previous experience they know that soldiers suffering from the disease invariably harbor pathogenic organisms in their feces and that for all practical purposes every disease stool specimen contains these organisms. The organisms are never abundant, however, and thus only 20% of all slides prepared by the standard procedure contain some of them. (We assume that if an organism is present on a slide, it will be seen.) How many slides per stool specimen should the laboratory technicians prepare and examine to ensure that if a specimen is positive, it will be erroneously diagnosed negative in less than 1% of the cases (on the average)?

5. Suppose $X_1, X_2, X_3, \dots, X_{10}$ are independent and identically distributed (iid), with mean=3 and SD=3. Calculate the following:

- (a) $E(X_1 + X_2 + \cdots + X_{10})$
- (b) $SD(X_1 + X_2 + \cdots + X_{10})$
- (c) $E[(X_1 + X_2 + \cdots + X_{10})/10]$
- (d) $SD[(X_1 + X_2 + \cdots + X_{10})/10]$