

Ma 322: Biostatistics

Homework Assignment 2

Prof. Wickerhauser

Due Friday, February 3rd, 2012

Read Chapter 7, pages 80–107, of our e-text to review some basic probability density functions and their properties, concentrating especially on the normal pdf. Consult Chapters 1-5 as needed to find function names and syntax to solve the computation problems below.

- Using Venn diagrams, depict five subsets A, B, C, D, E satisfying $A \subset B \subset C$, $B \cap D \neq \emptyset$, $A \cap D = \emptyset$, $C \cap E = \emptyset$, and $D \cap E \neq \emptyset$.
 - Is $C \cap D = \emptyset$?
- A standard set of 52 playing cards is divided into 4 suits of 13 ranks each: ace, 2, 3, 4, 5, 6, 7, 8, 9, 10, jack, queen, and king. The suits are called clubs, diamonds, hearts and spades, with clubs and spades being “black” and hearts and diamonds being “red.”
 - Taking 1 card at random, what is the probability of drawing a king of spades? a black king? a face card (jack, queen, or king)?
 - Taking 2 cards at random without replacement, what is the probability of drawing a pair of kings? a pair of clubs? a pair of black cards? a pair of cards of different ranks and suits?
 - Taking 5 cards at random without replacement, what is the probability of drawing a “full house,” namely 3 cards of one rank and 2 cards of a second rank?
- Suppose that x is a normally distributed random variable with mean 21.8 and standard deviation 1.34.
 - What is the probability that x is greater than 20? greater than 23? less than 20?
 - What is the probability that x lies between 20.8 and 22.8? between 22.8 and 24.8? between 24.8 and 26.8?
 - Use R commands to generate 10 independent random values of x . Compute the mean and standard deviation of those samples.
 - What is the theoretical standard deviation of the mean of 10 independent random samples of x ? What is the probability that a random set of 10 independent samples has a mean greater than 22? What is the probability that a random set of 1000 samples has a mean greater than 22?
- Present the following data on a graph that shows the mean, 95% confidence interval, and range for each month:

Table of caloric intakes (kcal/g of body weight) of squirrels.

Month	No. of data	Mean	Std. error	Range
January	14	0.662	0.040	0.451–0.903
February	13	0.544	0.039	0.385–0.793
March	17	0.487	0.028	0.412–0.589

5. A random sample of size 19 from a normal population has mean 17.92 cm and variance 8.2261 cm².
- (a) Calculate the 95% confidence interval of the population mean μ .
 - (b) How large a sample would be needed to estimate μ to within 1.00 cm with 95% confidence?
 - (c) How large a sample would be needed to estimate μ to within 2.00 cm with 95% confidence?
 - (d) How large a sample would be needed to estimate μ to within 2.00 cm with 99% confidence?
6. Generate 1000 samples from each of the following probability spaces (populations) and plot the resulting histogram.
- (a) X is standard normal; bins are of the form $\frac{1}{5}[k, k + 1)$ where k is an integer.
 - (b) X is χ^2 on 10 degrees of freedom; bins are of the form $[k, k + 1)$ where k is an integer.