Assignment due 7-23-10

Probability histogram, population and sample sd, etc.

1. For the following data:
2.6   6.3   6.5   2.9   6.7   6.5   5.8   2.6   8.8   4.6   5.5   4.3

a. The height of the probability histogram over the class interval [2.5, 4.5].

b. The median (sort the list).

c. All modes.

d. Median of the list -2 x + 4 where x is the above list.

e. σ for the list x.

f. σ for the list -2 x + 4.

g. s for the list x.

h. s for the list -2 x + 4.

i. On a number line place dots above the numbers in list x. Identify μ as the balance point.

j. Make a cumulative frequency plot for list x (see key 13). Two points to keep in mind:

   a. The plot should only jump upward by 1/n (as it passes over a single value such as 4.3 which only appears once in the list) or some multiple of 1/n (such as 2/n when passing over 2.6 which appears twice on the list). Elsewhere, the plot does not rise but remains flat (it only appears to rise continuously when the data is tightly packed as in the illustrations shown in the textbook).

   b. The textbook speaks of a cumulative frequency plot but is actually showing cumulative relative frequency plots since they rise from zero at the extreme left to one at the extreme right.

2.   There is a 0.003 probability the left engine fails and a 0.006 probability the right engine fails. Suppose these events are independent.

a. P(right engine fails |IF left engine fails).

b. P(both engines fail).

c. P(at least one engine fails).

d. P(neither engine fails).

Notice that "independence of failures" enables us to work from the reliability of individual components through to the reliability of systems involving those components. Otherwise, we cannot easily evaluate the reliability of the system.

|IF

e. For commercial airliner engines the conditions at airports introduce dependencies among engine failures. What is the reason for this?

f. Refer to (e). Is the actual probability
   P(right engine fails $|_{IF}$ left engine fails)
likely to be larger or smaller than suggested by your answer to (a)?

3. The following pertains to 15 runs, each of which charts the accumulating revenues coming to a casino over 10000 plays of one of its games.
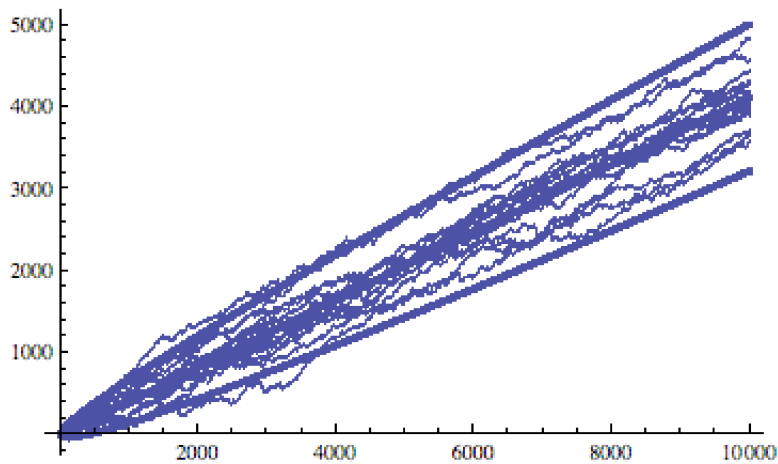
a. What is the per-play mean return to the casino?

b. Name five important features shown in this example that we've claimed are usual for such plots.

c. If you double the standard deviation of the per-play return but keep the mean the same what happens to the plot?

4. Random variables X, Y are independent.

a. Express E(a X + bY + c) in terms of the constants a, b, c and E X, E Y. Is independence required?

b. Suppose the average money held on the person of MSU students is $4.37. Suppose the average coin money held on the person of MSU students is $0.52. What is the average paper money held on the person of MSU students?

c. Refer to (b). If we multiply the money held by each MSU student by the last digit of their student number what do you think would be the average result?

d. Express Variance(a X + b Y + c) in terms of the constants a, b, c and Variance X, Variance Y. Is independence (or something close to it) required?