Gan/Kass
Phys 416

LAB 1

1) Roll a six-sided dice 100 times. Record each roll of the dice and plot the probability distribution (i.e. make a histogram using KALEIDAGRAPH) for the 100 rolls.

a) What is your measured probability for the dice to come up with a 6? How does this value compare with what you expect for this probability? Indicate the expectation on the plot.

b) A sample computer program written in FORTRAN that simulates the roll of a dice can be found in the "A Physics 416 Fortran Tutorial" handout. Use this program (or write your own!) to roll the dice 1,000, 10,000, and 100,000 times. Overlay the probability distribution for each of the computer runs on the plot for the 100 rolls of the dice. How does each of these data samples compare with what you would expect for a probability distribution from a six-sided dice?

2) Roll two six-sided dice 100 times and plot the probability distribution for the sum of the two dice (i.e. how often does 2,3,4...12 come up).

a) Plot the theoretical expectations for this probability distribution on the same plot as your measured probability distribution. Compare on how well theory and experiment agree.

b) Modify the program (actually make a new program, but start with the old one) used in 1b) so that it simulates throwing two dice. Again, use the program to roll the dice 1,000, 10,000, and 100,000 times. Overlay these results on the plot from 2a) and comment on how these results compare with the theoretical expectations.

3) Toss a coin 100 times and record the number of heads and tails.

a) Plot the probabilities for heads and tails. How does the probability for heads compare with what you expected?

b) Write (or modify) a computer program that simulates the tossing of a coin. Using your program to toss the coin 1,000, 10,000, and 100,000 times. Overplot the probability distributions on the same plot. How do each of these data samples compare with what you would expect for a probability distribution describing a coin?

Caution: In part 3) you must use the random number generator (RAN) in a slightly different fashion than used in parts 1) and 2) above. Remember RAN gives a number between [0,1].