

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) Attached is a sample computer program written in BASIC that simulates the roll of a dice. Use this program (or write your own!) to roll the dice 1000, 10000, and 100000 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) Compare your results with the theoretical expectations. Indicate the expectations on the same plot.
 - 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 1000, 10000, and 100000 times. Overplot these results on the same plot 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 toss the coin 1000, 10000, and 100000 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].

Below is a sample program written in BASIC:

```
REM**This program simulates throwing a dice
REM**The die has six sides, each side is labeled (e.g.) by one to six dots
REM**The number of times the die is tossed is given by the variable: roll&
REM**The result of an individual toss (a 1 or 2,..or 6 dots) is given by the
variable: dice%
REM**the variable d& is an ARRAY. It keeps track of the number of times a 1
(2,etc) was
REM**rolled
DIM d&(8)
RANDOMIZE TIMER
INPUT"How many rolls of dice :";roll&
FOR ii& =1 TO roll&
REM**RND is a computer function that gives us a random number in the range
(0,1).
dice%=INT(1+6*RND)
d&(dice%)=d&(dice%)+1
NEXT ii&
REM**Print the results to the computer screen
FOR i%=1 TO 6
PRINT i%,d&(i%)
NEXT i%
INPUT"Enter any key to quit:";x$
STOP
```

Consult the MICROSOFT BASIC manual to see how to get this program into the computer.

NOTE: ASK FOR HELP IF YOU ARE NOT FAMILIAR WITH BASIC !!!