

MATH 1180  
MATHEMATICS FOR LIFE SCIENTISTS  
Computer Assignment VI  
Due February 24, 2004

## PROBLEMS

Warm up Maple for today's problems with the commands

```
> iread(histplot);  
> iread(draw);  
> with(stats);  
> iread(iter);
```

- 1. Recall the method for generating “random numbers” between 0 and 1:

```
> number := x -> stats[random,uniform[0,1]](1);
```

These numbers are associated with the probability density function (pdf)  $f(x) = 1$  for  $0 \leq x \leq 1$ . Here are the commands to make a data set of 50 such numbers called `dat`, and find their average, type

```
> dat := [seq(number(),i=1..50)];  
> describe[mean](dat);
```

There are a bunch other useful `describe` commands that we will meet later.

- a. Find the average of your 50 numbers.
  - b. Use the definition to find the mathematical expectation (average value) of random numbers with the pdf  $f(x)$ .
  - c. Try the same steps but make `dat` include 500 numbers instead. Is the result closer to the mathematical expectation?
- 2. The command `histplot` (note the `iread(histplot)` command above) can be used to plot a probability distribution as a histogram. To enter a probability distribution, type

```
> a := [1,2,3,4];  
> p := [.1,.6,.2,.1];
```

The array `a` lists the possible values, and `p` the probabilities. In this case, the random variable take the value 1 with probability 0.1 and so forth. To plot a histogram, type

```
> histplot(a,p);
```

To pick a random sample of these events, use the command

```
> draw(a,p);
```

This pulls a 1 with probability 0.1, a 2 with probability 0.6 and so on.

- a. Draw 50 events (using the `seq` command) and save the result as `dat2`. Compare the fraction of 1's, 2's, 3's and 4's with what you see on the histogram. A clever way to do this uses the `transform` command as follows

```
> transform[tally](dat2);
```

- b. Find the average of your 50 numbers.
- c. Use the definition to find the expected value. How close is it to the average?