Chapter 8

Probability and Statistics

8.1. Discrete Probability Distributions

8.1.1. Binomial Distribution

The terms in the expansion of

\[(L + (1-L))^R \quad (R \text{ positive integral, } 0 < L < 1)\]

are

\[BINPROB: (L \times T) \times ((1-L) \times T \times (T+0, R))!R\]

Example:

\[.5 \ \text{BINPROB} \ 4\]

\[0.0625 \ 0.25 \ 0.375 \ 0.25 \ 0.0625\]

HIST (see Appendix 1) demonstrates the above result graphically.
8.1.2. Poisson Distribution

The first $L + 1$ terms for mean $R$ are $e^{-R}R^k/k!$ for $k = 0, \ldots, L$, or in APL

\[ \text{POISSON}: (\star-R) \times (R \times T) \div !T \div 0, \ldots, L \]

Comparison with binomial

The difference between a binomial series with $n = 10$, $p = .1$, and a Poisson series with mean 1 is shown by

\[ 5 \text{ POISSON 1} \]
\[
0.3679 \ 0.3679 \ 0.1839 \ 0.06131 \ 0.01533 \ 0.003066
\]

\[ 6+.1 \text{ BINPROB 10} \]
\[
0.3487 \ 0.3874 \ 0.1937 \ 0.0574 \ 0.01116 \ 0.001488
\]